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RECORD OF DECISION,
DECISION SUMMARY, AND
RESPONSIVENESS SUMMARY

FOR

FINAL REMEDIAL ACTION
NORTHSIDE LANDFILL SUPERFUND SITE
SPOKANE, WASHINGTON

SEPTEMBER 1989

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

FINAL REMEDIAL ACTION
NORTHSIDE LANDFILL SUPERFUND SITE
SPOKANE, WASHINGTON

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

SITE NAME AND LOCATION

Northside Landfill
Spokane, Washington

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Northside (North) Landfill site in Spokane, Washington, developed in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for the site, which is attached as Appendix B.

The state of Washington has been involved closely with this decision. Although the state's comments on the Proposed Plan are incorporated into this Record of Decision (ROD), EPA has not yet received the state's concurrence letter.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The remedy documented by this ROD is designed to protect public health and the environment by preventing the consumption of groundwater which has been contaminated by solvents from the landfill, and by reducing the migration of those contaminants. Major elements of the selected remedy include:

- requiring closure of the landfill as soon as possible;
- capping the landfill after closure to minimize entry of precipitation into the wastes;
- pumping and treating the contaminated groundwater to reduce the amount of contaminants entering the aquifer (this is a protective measure which will operate until the closure and capping actions prove effective in reducing aquifer contamination);
- monitoring groundwater around the landfill and downgradient from it to track changes in the extent and nature of the contamination plume;
- providing an alternate supply of drinking water to those residents whose well supply has become contaminated by the landfill;
- enacting administrative restrictions to protect the landfill cap, closed units, and monitoring wells from unauthorized access, and address construction of domestic wells in the contaminant plume; and

- controlling landfill gas emissions (the city of Spokane is developing a separate Landfill Gas Management Report to address this issue).

For the purposes of selecting a remedy, the North Landfill site was divided into five units. Four of these units are areas of the landfill. They are the refuse, skimmings, old burn, and sewage sludge units; only the refuse unit is currently in use. The fifth unit is the aquifer beneath the site. The selected remedy is the same (capping) for each portion of the landfill. The cap will be designed to reduce landfill leachate generation and thus control future contamination of the groundwater beneath the site. Part of the site is still actively receiving refuse and will continue to do so until December 31, 1991. Beginning in 1992, all refuse will be diverted either to a planned waste-to-energy facility, new units to be constructed at Northside, or an alternate landfill site. Closure of the non-active units may begin after approval of the closure plan, with final closure beginning in 1992 after the existing refuse unit is no longer receiving wastes.

The pump and treatment remedial action will actively control the source of groundwater contamination leaving the landfill. This will allow the contamination to naturally attenuate and restore its usefulness.

DECLARATION

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this site. However, because treatment of the wastes at the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The size of the landfill and the existing state of technology rendered treatment and/or excavation not feasible for this site.

The selected remedy does not require placement of RCRA hazardous wastes either on or offsite. Therefore, the Land Disposal Restrictions do not apply.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

30 September 1989
Date

Regional Administrator
Environmental Protection Agency
Region 10

DECISION SUMMARY
FINAL REMEDIAL ACTION

NORTHSIDE LANDFILL
SPOKANE, WASHINGTON

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DECISION SUMMARY

SITE LOCATION AND DESCRIPTION

The Northside Landfill, also known as the North Landfill, is located in the northwest corner of the city of Spokane, in Spokane County, Washington. The landfill covers 345 acres and is bounded by Nine Mile Road and the bluff of Five Mile Prairie (Figure 1). It is surrounded by a chain link fence, with one main gate; structures near the gate include a gatehouse, truck weighing station, two equipment storage areas, and a caretaker's trailer.

The landfill is located in a mixed residential and undeveloped agricultural area. The Agency for Toxic Substances Disease Registry review found there are 20 homes with approximately 65 residents in the area of the contaminated groundwater plume from the landfill.

The Spokane Valley-Rathdrum Prairie Aquifer (SVRPA) lies beneath approximately the western one-third of the landfill. This aquifer was designated as a sole source of water supply for the Spokane-Coeur d'Alene area by the U.S. Environmental Protection Agency (EPA) in 1978, under the 1974 Federal Safe Drinking Water Act (Public Law 93-523). Highly permeable sands and gravels deposited by glacial meltwater streams (glaciofluvial deposits) make up the majority of the aquifer, with subordinate lenses of clay and zones of cobbles. The remainder of the landfill is directly underlain by unsaturated glaciofluvial sands and gravels with less permeable glacial lake deposits and basalt occurring at depth.

The climate in the area is semiarid, with 17.2 inches average precipitation at the Spokane Airport and about 15 inches at the landfill. Most of the precipitation falls during winter as snow. Average annual snowfall at the airport is 58 inches. Frost typically penetrates from 12 to 18 inches into the ground; however, during unusually cold winters it may penetrate 36 inches or more.

Identification of Landfill Units

The Northside Landfill site was divided into sections for evaluation in the feasibility study. The identification of these different areas was based on past disposal practices and the nature and extent of contamination. These areas are referred to as "Units" and were evaluated on the basis of the different technologies that were applicable to each unit. The units are (Figure 2):

Refuse Unit
Skimmings Unit
Old Burn Unit
Sewage Sludge Unit
Aquifer Unit

Refuse Unit--The portion of the landfill still receiving solid waste (since 1962). It measures 115 acres and had received approximately 4,400,000 cubic yards of waste as of December 1987. Small quantities of cleaning solvent sludges are assumed to be interspersed throughout this waste. Refuse enters this unit at the current rate of 500-600 tons/day.

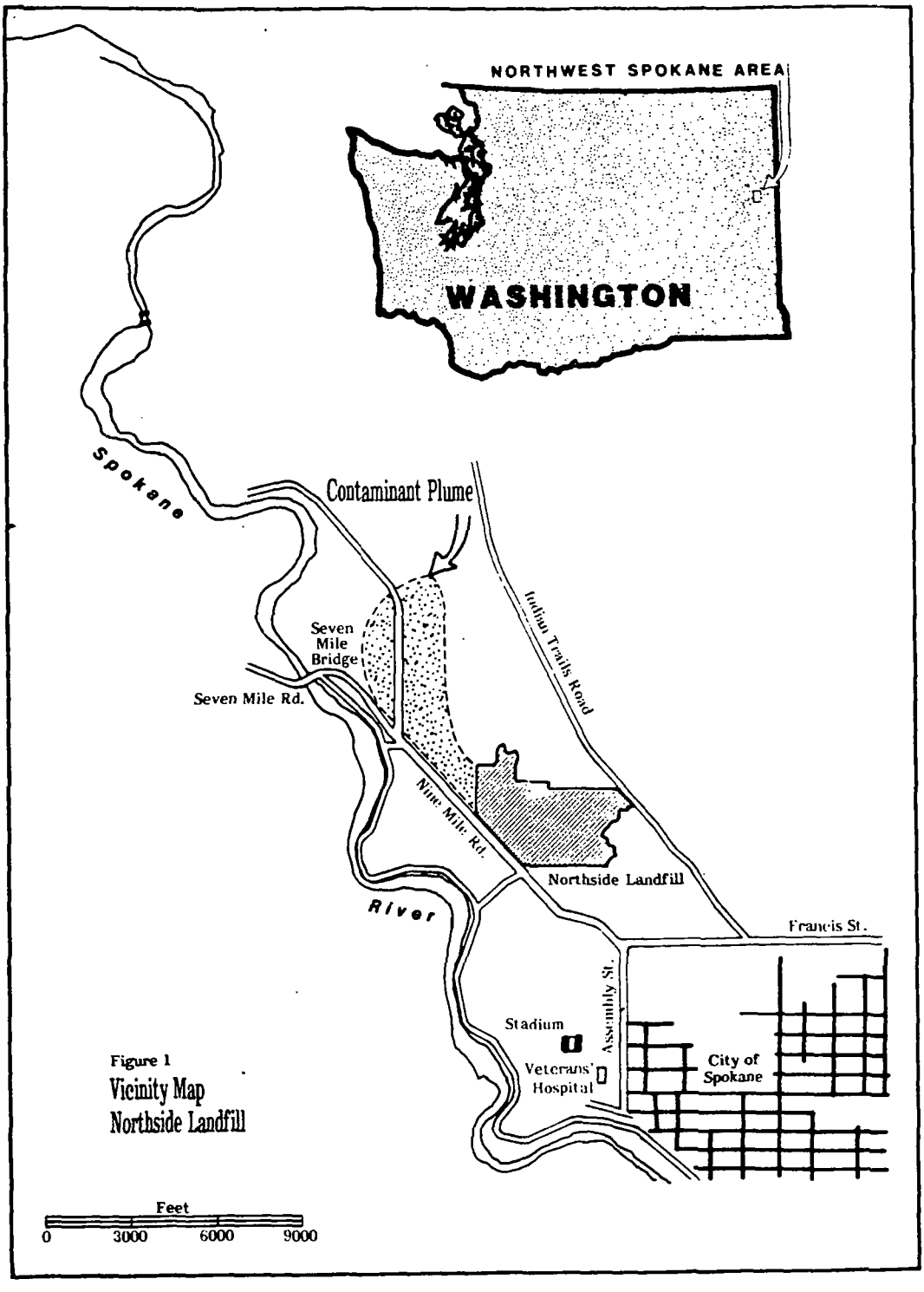


Figure 1
Vicinity Map
Northside Landfill

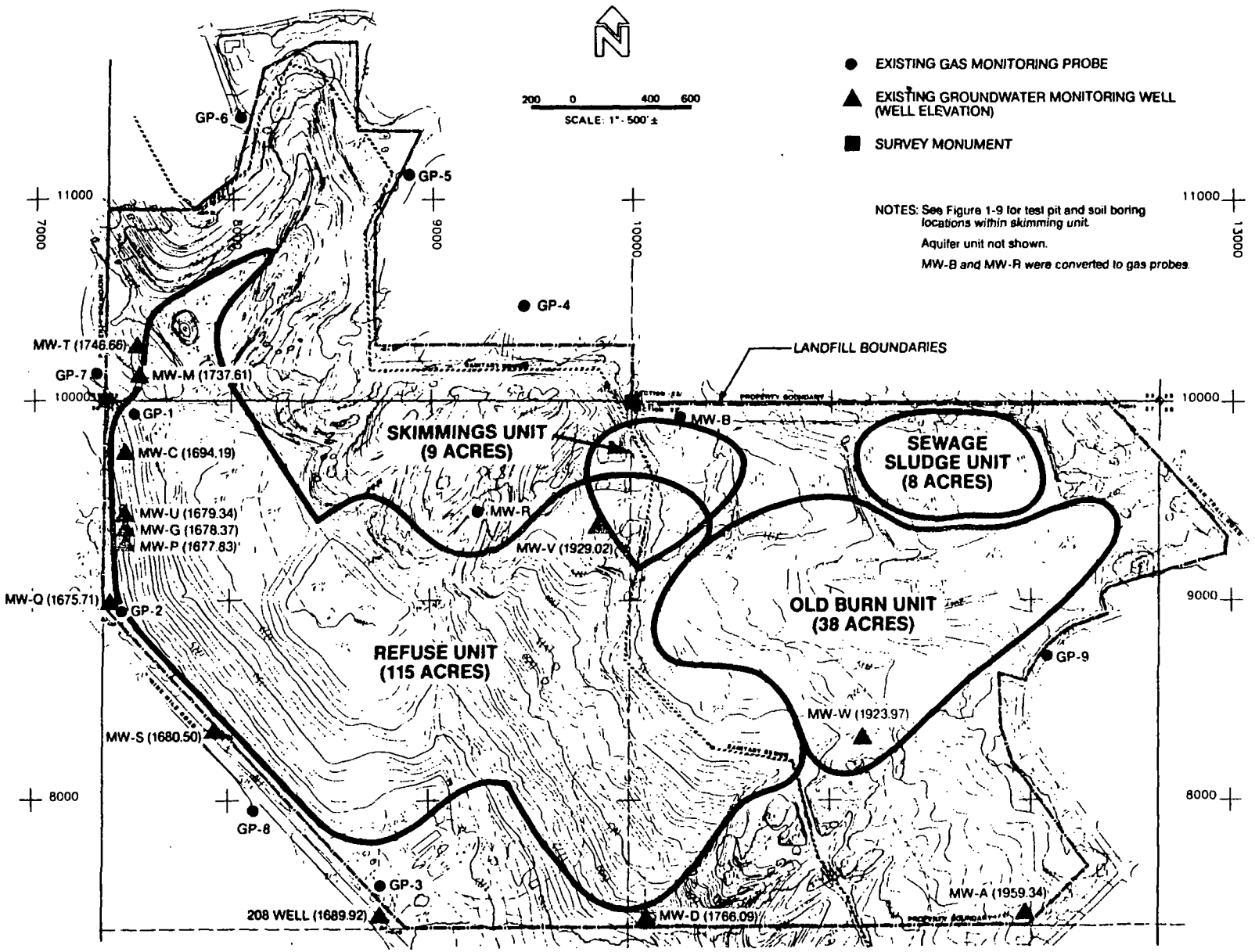


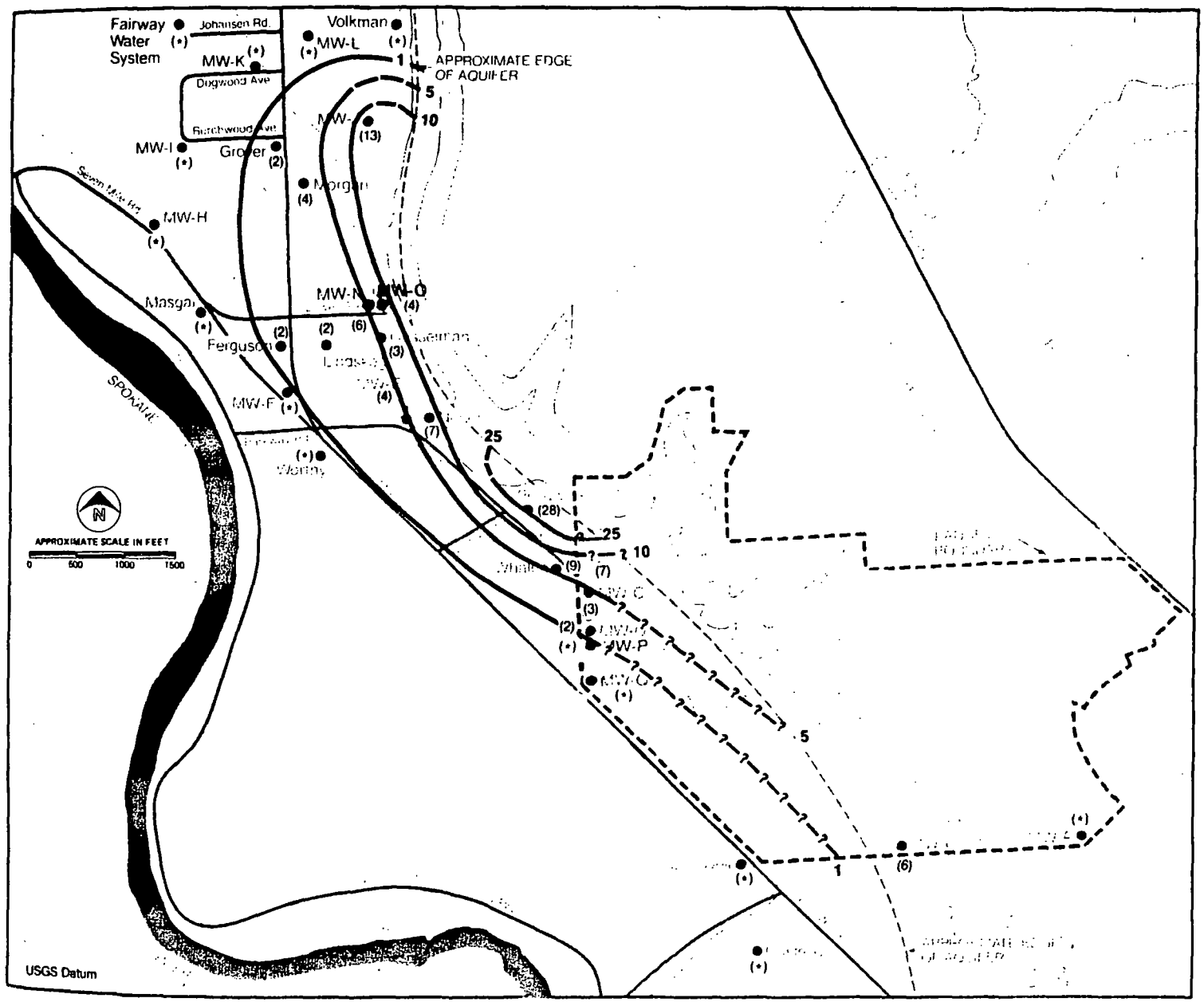
Figure 2
LANDFILL UNITS

Skimmings Unit--The portion of the landfill that received grease skimmings from the city's wastewater treatment plant from about 1972 until 1987. The disposal pit area is approximately 3 acres in size; if the landfill area between the pits is included in calculating the area, it increases to 9 acres. For the purposes of cost calculations, the smaller area was used. Using an average depth of 5 feet for skimming deposits, this area contains about 24,000 cubic yards of skimmings. The skimmings contain low concentrations of tetrachloroethylene (PERC), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA), which are volatile organic compounds (VOCs).

Old Burn Unit--The landfill section in which refuse was subject to open burning between 1930 and 1962. It is 38 acres in size, contains approximately 3 million cubic yards of ash, noncombustible material, and burned refuse and is covered with several feet of soil (some small areas of ash are exposed at the road cuts). The area has naturally revegetated with grasses and weeds. Data presented in the Feasibility Study (FS) do not indicate the presence of VOCs.

Sewage Sludge Unit--The section of the landfill which received digested sludge from the city's wastewater treatment plant from about 1972 until 1983. It is approximately 8 acres in size and 25 feet deep. It is covered with soil and natural vegetation. Data in the FS indicate that volatile organics probably would not leach from this area because a high percentage of the VOCs are destroyed or volatilized in the wastewater treatment and sludge digestion process.

Aquifer Unit - That portion of the Spokane-Valley Rathdrum Prairie Aquifer (SVRPA) that contains concentrations above detection limits of PERC that has leached from the landfill into the groundwater. Currently that limit is defined by the 1 ug/l concentration curve. PERC has been detected further away from the landfill than any other contaminant (see Figure 3).



LEGEND

5 —— PERC ISOCONCENTRATION CONTOUR (µg/l)

?—?— INFERRED ISOCONCENTRATION CONTOUR

● MONITORING WELL SAMPLED FOR PERC IN JUNE 1986

( ) JUNE 1986 PERC CONCENTRATION (µg/l)

* NOT DETECTED

Figure 3

DISTRIBUTION OF PERC
JUNE 1986

HISTORY OF SITE OPERATIONS

The Northside Landfill site has been used since the 1930s by the City of Spokane and a variety of private and public haulers for disposal of residential and light commercial refuse. The City of Spokane has a total population of about 180,000, and the landfill serves some suburban customers as well. It is one of two publicly owned landfills still in operation in Spokane County. Several other landfills have been closed in recent years; three of these--Colbert, Greenacres, and Mica--are also Superfund sites. Due to closures, Northside is currently receiving almost 70 percent of the county's nonrecycled waste (about 600 tons per day). The city and county together are planning to construct a waste-to-energy facility, to be operational by late 1991, to alleviate the waste disposal capacity problem. After review of city records and an assessment of the solid waste stream, it has been determined by EPA and the City of Spokane that industrial wastes have not been sent to the Northside Landfill and are, for the most part, handled by other facilities located in the County. There are very few historical records of waste quantities or type received at the landfill. A waste stream analysis was done by reviewing previous studies of waste type and disposal practices of all businesses in the city.

The site became the city's primary refuse dump about 1931. During the 1930s and into the 1940s, the northeast portion of the site was an open dump where the refuse was burned. A refuse incinerator was constructed in the 1940s, but open burning continued at the site until at least the late 1950s. For a number of years, the ash from this municipal incinerator as well as bottles, cans, and other noncombustibles were the major components of the waste deposited at the site. Any refuse that did not burn was left uncovered.

Between 1962 and 1973, landfilling practices began in the central area of the site. This involved placing the wastes on the existing grade and covering them with earth scraped or dug from nearby areas. This refuse was not burned and received periodic cover.

The trench method of landfilling began in 1973, adjacent to Nine Mile Road. The trench method of landfilling involves digging deep trenches (as much as 20 feet below existing grade), filling them with waste, and then covering this with dirt excavated from the trenches.

Currently, cover material is excavated from ridges located along the north side of the site. This material is being used to cover new refuse and to add lifts (step-like plateau areas) on top of the older, lower, western portion of the landfill. These lifts (about 20 feet thick) have contained the refuse to a total depth of about 125 feet.

SITE INVESTIGATIONS AND REMEDIAL ACTIVITIES

In 1981, the City of Spokane hired CH_2M Hill, an engineering firm, to investigate the hydrogeology and water quality in the area of the site. CH_2M Hill installed four onsite groundwater monitoring wells in the fall of 1982; samples taken from these wells indicated the presence of low concentrations of volatile organic compounds (VOCs). One year later, in October 1983, investigations revealed the presence of VOCs in offsite groundwater from samples taken from residential wells located northwest of the landfill. The city immediately supplied the 19 affected residences with bottled water and approved the extension of municipal water lines to the area. All of the affected residences were located in the Pine Meadows housing development just northwest of the city limits; all were connected to the city water supply by November 1983. Spokane representatives completed water line connections to 16 additional residences in the Pine Meadows area in spring 1984. The municipal system is now serving additional residential areas northwest of the landfill that are not being impacted by the contamination plume.

In the spring of 1985, the City of Spokane installed nine additional wells to monitor water quality at the site. There are currently 10 offsite and 11 onsite groundwater monitoring wells. The remedial activities conducted after this effort are described under enforcement activities in the next section.

ENFORCEMENT ACTIVITIES

Contamination of the SVRPA was noted by the late 1970s and was traced to Northside Landfill, but no enforcement actions were taken at that time. The city applied for a solid waste disposal permit in 1979 and the Spokane County Health Department granted it, though they recommended stepped-up groundwater monitoring and measures to keep hazardous waste out of the landfill. The only recorded permit violation was in July 1988, when the health district notified the city that gas levels at the landfill were too high.

On October 15, 1984, EPA proposed the Northside Landfill for inclusion on the National Priorities List (NPL). In March 1985, EPA and the Washington State Department of Ecology (Ecology) signed an agreement whereby Ecology assumed the lead responsibility for remedial actions at Northside. The site was formally listed on the NPL on June 10, 1986 (51 Federal Register 21054).

The City of Spokane is the sole identified Potentially Responsible Party (PRP) for Northside Landfill. The city was notified of its potential liability by EPA in September 1985 and by the state of Washington in January 1986.

In February 1986, Ecology and the City of Spokane signed an agreement authorizing the city to conduct the remedial investigation for the Northside Landfill site. The agreement included conditions that would bring the city into compliance with federal regulations regarding investigations of hazardous waste sites. The City of Spokane submitted a draft Remedial Investigation (RI) report in October 1986 to EPA, Ecology, the Washington Department of Social and Health Services, and the Spokane County Public Health District. Based on that report, dry cleaning sludges and wastewater treatment plant grease skimmings were identified as possible sources of chemical contamination in the landfill waste. City representatives presented information concerning the investigation and related issues at a public meeting on December 11, 1986.

The city submitted a draft Feasibility Study (FS) report in early 1987. In this report, the city evaluated various alternatives for addressing contamination problems in three areas: contaminated refuse, treatment plant skimmings, and groundwater.

After reviewing the draft FS, EPA and Ecology asked the city to install additional monitoring wells. These wells were required to help characterize the extent of the contamination plume in the aquifer. The city and Ecology were unable to come to an agreement on the proposed wells and Ecology requested that EPA take the lead. Subsequently EPA signed a consent order with the city on March 16, 1988, to complete the wells and undertake future remedial actions. With the signing of this order, EPA became directly responsible for overseeing activities at the site.

Under the terms of the EPA-Spokane Consent Order, the city revised and resubmitted the draft RI and FS documents in August 1988. A public meeting on the results of the draft RI was held in September 1988; the public meeting on the draft FS and proposed EPA recommended action (proposed plan) was held March 15, 1989. A public comment period was held on the RI/FS from March 1 to March 31, 1989.

COMMUNITY RELATIONS

The specific requirements for public participation at Northside Landfill under CERCLA, as amended by SARA, include releasing the RI/FS and proposed plan to the public. This was done in February 1989. Both documents were placed in the administrative record and information repositories. Notice of the availability of these documents, plus notice of a public meeting on the proposed plan and public comment period was published in the Spokesman-Review on February 28, 1989. A public comment period was held from March 1 to March 31, 1989. A public meeting was held on March 15, 1989, with presentations given by EPA, Ecology and the City of Spokane. Comments from the public were taken and are summarized in the Responsiveness Summary portion of this document.

Community relations activities have maintained effective communication between the citizens living near the landfill, the city and EPA. Discussion between the different groups for information purposes and suggestions on the project has been open. The actions taken to satisfy the requirements of the federal law have also provided a forum for citizen involvement in reaching the remedial action decision.

EPA's community relations activities at the site include the following:

- August 1987: EPA and its contractor, EBASCO, conducted community interviews to develop a community relations plan.

- November 1987: EBASCO submitted to EPA the Community Relations Plan for the site. The plan was distributed to the information repositories at the main Spokane Library and the Spokane Engineering Services Library. The administrative record was placed in the Spokane Library.

- May 12, 1988: EPA distributed a fact sheet to persons on the mailing list. It explained the Consent Order between the City of Spokane and EPA for completing the Remedial Investigation.

- July 1988: EPA distributed a Revised Community Relations Plan which provided up-to-date information on the site and future opportunities for public involvement.

- September 1, 1988: EPA distributed a fact sheet announcing a public meeting on the Remedial Investigation.

- September 15, 1988: EPA hosted an informational meeting for the public to explain results from the Remedial Investigation. Three members of the public attended.

- February 28, 1989: EPA distributed the proposed plan fact sheet to the persons on the mailing list. This fact sheet outlined the RI/FS results; it also explained EPA's preferred plan and how it differed from that recommended in the FS. The fact sheet also announced a public meeting on March 15, 1989, and the dates of the public comment period. A public notice describing the proposed plan and the public meeting was placed in the Spokesman-Review.

- March 1 to March 31: Public comment period on Proposed Plan.

- March 12, 1989: A second notice for the public meeting held on March 15 appeared in the Spokesman-Review.

- March 15, 1989: EPA held a public meeting to explain the RI/FS results and the proposed plan. About 30 people attended the meeting; 10 citizens gave verbal comments. A record of the meeting is part of the Responsiveness Summary, Appendix A.

- May 2, 1989: A fact sheet summarizing the public comments and EPA's response was distributed to the persons on the mailing list. Those who commented during the comment period also received a copy of the complete Responsiveness Summary. Copies of the Responsiveness Summary were placed in the Spokane Public Library and Spokane's Engineering Services Library.

SITE CHARACTERISTICS

Hydrogeology

The Northside Landfill, situated about one-half mile east of the Spokane River, overlies a portion of the Spokane Valley-Rathdrum Prairie Aquifer (SVRPA). This aquifer was designated as a sole-source water supply for the Spokane-Coeur d'Alene area by the EPA in 1978, under the 1974 Federal Safe Drinking Water Act (Public Law 93-523). Highly permeable sands and gravels make up the majority of the aquifer, along with lenses of clay and zones of cobbles and boulders.

The installation of monitoring wells has confirmed that the refuse area is primarily over the SVRPA although the aquifer boundary has not been precisely defined. The aquifer surface is about 80 feet below the level of Nine Mile Road and is over 200 feet thick at the deep monitoring well at the northwest corner of the landfill. Hydraulic measurements help to define the aquifer as a large and very productive aquifer which has average linear flow velocities from 25 to 30 feet per day under parts of the landfill.

Groundwater Contamination

Volatile organic compounds and metals have been detected in the groundwater beneath and northwest (downgradient) of the landfill. Tetrachloroethylene (PERC) and trichloroethylene (TCE) are present in the aquifer both onsite and offsite at levels that exceed the EPA's existing or proposed Maximum Contaminant Levels (MCLs) for drinking water. Iron, manganese, and lead also exceed drinking water criteria in several wells. Table 1 gives a range of groundwater contaminants found in and around the landfill since monitoring began in 1983. The locations of the wells is shown on Figure 4.

PERC and iron are the only two contaminants consistently present in offsite wells at concentrations in excess of any existing or proposed standard. PERC is listed as a Group B2 carcinogen (i.e., probable human carcinogen based on evidence from experiments with animals). In addition, its offsite concentrations were also higher than concentrations of other compounds and it has been recorded in the greatest number of wells. Thus, PERC was selected as the primary compound of concern for this site.

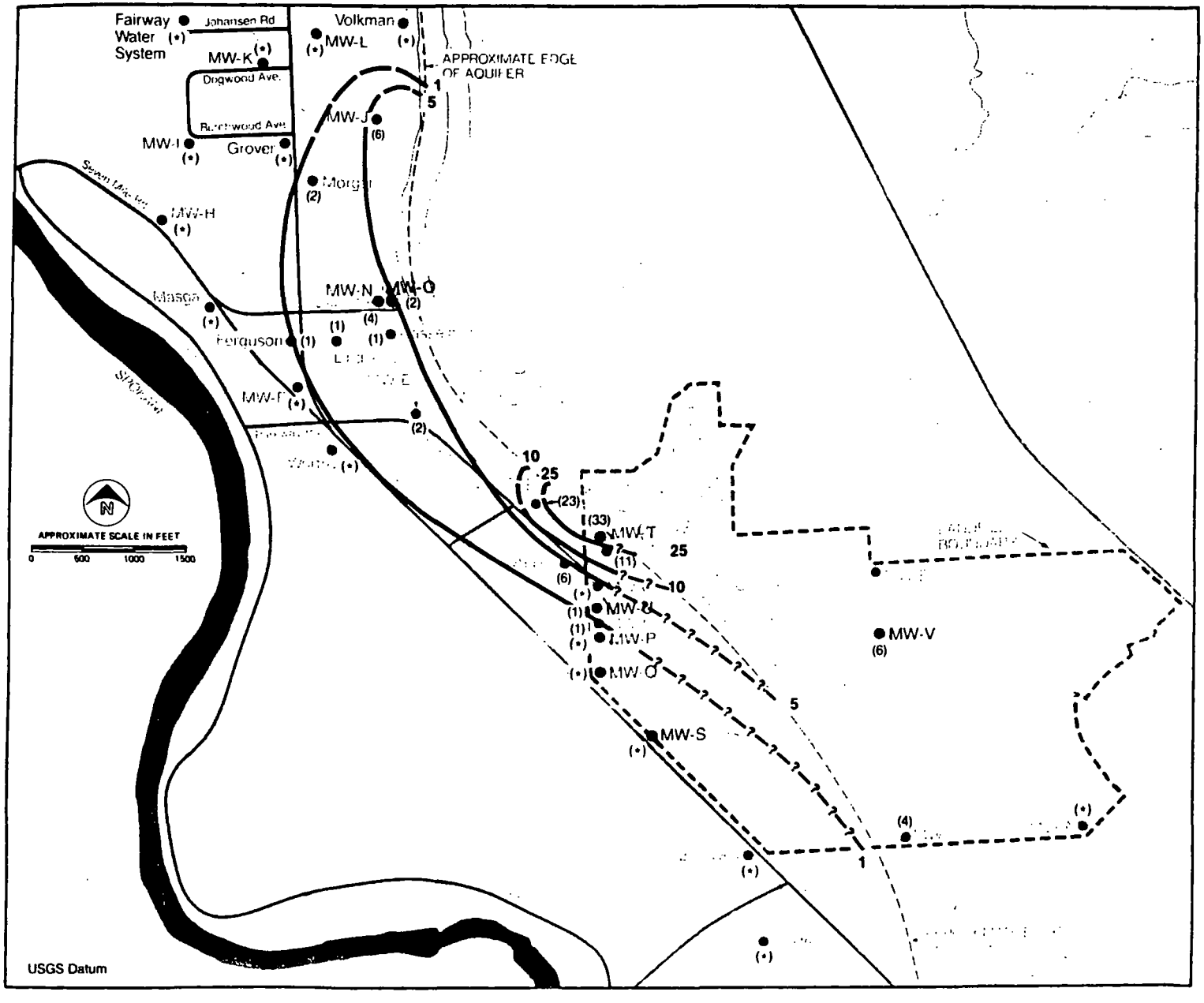
Iron was found in concentrations above the Secondary Drinking Water Criteria for taste and odor. Because this does not present a health or environmental risk, iron was not considered a contaminant of concern.

Six other compounds in addition to PERC that have known health effects have been detected in offsite wells: chloroform, TCE, 1,1,1-trichloroethane (TCA), 1,2-(trans)dichloroethylene, 1,1-dichloroethane, and vinyl chloride. Of these six compounds, only TCE and TCA were detected frequently enough and at concentrations sufficient to make predictions of concentrations at points of exposure. Therefore, TCE and TCA were also selected as compounds of concern for the purpose of evaluating public health risks associated with this site. Vinyl chloride was detected once in one offsite well and two onsite wells at detection limits. Although vinyl chloride is an end product for chlorinated solvents, its detection only once at the Northside site is not sufficient to select it as a contaminant of concern.

TABLE 1
RANGE OF CONTAMINANT LEVELS
ON AND OFF-SITE

	Groundwater				Soil	Air	Gas
	On-site wells		Off-site wells				
Organics (ug/l)							
Chloroform	ND -	<5	ND -	6	ND	ND	ND
TCA	ND -	15	ND -	15	ND	ND	ND - .3J
TCE	ND -	22	ND -	9*	ND	ND	not tested
PERC	ND -	33	ND -	28	ND	not tested	not tested
1,2-Transdichloroethylene	ND -	2	ND -	6	ND	ND	not tested
1,1-Dichloroethane	ND -	22	ND -	6	ND	ND	ND
Vinyl Chloride	ND -	1	ND -	1	ND	ND	ND - 1.1
Methylene chloride	not tested				ND	1.7 - 5.7	ND .3J
Acetone	not tested				ND	3 - 6	ND - .8J
Toluene	not tested				ND	ND - .6J	ND - 1
Benzene	not tested				ND	ND	ND - .6
Ethylbenzene	not tested				ND	ND	ND - 1.3
Xylenes (o & m)	not tested				ND	ND	ND - .8
Inorganics (tested for in groundwater only)(mg/l)							
Iron	<.01 -	18.02	ND -	.37			
Lead	ND -	.055	ND -	.016			
Zinc	.001 -	.399	.001 -	1.165			
Calcium	16.8 -	160	41.6+				
Magnesium	15.8 -	109	44.6+				
Sodium	4.7 -	17.8	7.0+				
Copper	<.001 -	<.010	ND -	.043			
Cyanide	<.001 -	<.005	<.01+				
Chloride	.8 -	66.5	2.1 -	64.8			
Sulfate	6.5 -	48.4	18 -	44			
Manganese	<.002 -	1.97	<.01 -	.162			
Cadmium	<.002 -	.005	<.002 -	.004			

ND = none detected
J = estimated trace value
* one inconsistent result of 22 (Masgai well); suspected sample bottle contamination
+ only sampled for once, from a single well



LEGEND

- 5 —— PERC ISOCONCENTRATION CONTOUR (µg/l)
- ? — ? — INFERRED ISOCONCENTRATION CONTOUR
- ● MONITORING WELL SAMPLED FOR PERC IN JUNE 1988
- ( ) JUNE 1988 PERC CONCENTRATION (µg/l)
- ★ NOT DETECTED

Figure 4
DISTRIBUTION OF PERC
JUNE 1988

PERC, TCE, and TCA are degreasers or solvents that have been used for many years in a number of household products, dry cleaning agents, and industrial metal cleaners. The feasibility study states that cleaning solvent sludges from dry cleaners and other small businesses are probably the major source of these compounds in the landfill wastes. Analyses of dry cleaning sludges from establishments which used the landfill have shown as much as 2 percent PERC by weight, as well as lower concentrations of other VOCs. It has been calculated that about 300 tons of dry cleaning sludges were taken to the site.

The city stopped accepting dry cleaning wastes at the landfill in 1983. This was after EPA began regulating dry cleaning sludges as a hazardous waste in 1980. Prior to 1983 the dry cleaning wastes were a part of the normal waste stream and were distributed throughout the refuse disposal areas. Available information indicates that all of the dry cleaners in Spokane generate less than 1000 kg/mo of RCRA hazardous wastes and are therefore classified as Small Quantity Generators, who are allowed to dispose small amounts of hazardous wastes in landfills. Any dry cleaning wastes that arrived prior to 1962 would have been subjected to open burning which would have reduced the concentration of VOCs. Those arriving between 1962 and 1983 are in the 115 acre main landfill area currently in use.

Another source of VOCs is the liquid waste pits located in the upper, eastern portion of the landfill. These pits received grease skimmings from the wastewater treatment plant. Skimmings have not been dumped in these pits since 1987. Analyses of the skimmings and the contaminated soils in the pits have shown up to 3,400 ug/kg PERC, 1,200 ug/kg TCA, and 6,800 ug/kg TCE.

Another type of solid waste that was disposed of at the site was digested sewage sludge from the City of Spokane wastewater treatment plant. Sewage sludge disposal began in 1977 when the wastewater treatment plant converted to secondary treatment. Until mid-1979, several disposal techniques were used, including mixing the sewage sludge with the incoming solid waste, lagooning, and land spreading. In 1979, a trench disposal operation was devised in the northeast portion of the landfill. It consisted of a series of 6-foot deep trenches in alternating directions on successive lifts. Between 1978 and 1980, an average of 305 cubic yards per day of digested sewage sludge, containing at least 16 percent solids, was deposited in the landfill. The sludge was stabilized with ferric chloride and lime at 13 and 46 percent, respectively, on a dry weight basis. In 1978 the pH of the sludge ranged from 10 to 11. In late 1983 the sewage sludge disposal operation at the landfill was discontinued. The sewage sludge appears to contain small amounts of contaminants. Analyses of sewage sludge conducted in 1987 and 1988 did not detect any PERC or TCE, although TCA and several other VOCs were detected in some samples.

Contaminant Migration--Groundwater

Since November 1982, the City of Spokane has conducted a major groundwater sampling program in and around the Northside Landfill. Currently, the program consists of quarterly monitoring of 11 onsite and 11 offsite monitoring wells and 13 domestic wells. Figure 4 shows wells that are sampled on a regular basis. The groundwater quality data collected by the City are presented in the Supplemental Remedial Investigation Addendum dated November 1988.

More than 500 groundwater samples from more than 75 wells have been tested for organic and inorganic contamination by the City of Spokane since contamination of the SVRPA by VOCs was discovered in November 1982. In addition, nearly 300 groundwater samples from about 35 wells have been tested for inorganic contamination. Throughout this period, the concentrations of contaminants, particularly for organic contaminants, in individual wells have remained relatively constant.

The RI/FS states that the area of the PERC contaminant plume has remained relatively constant between 1983 and the present, indicating that the concentration in the aquifer has reached a dynamic equilibrium or "steady state" condition. Figures 3 and 4 give PERC concentration contours for June 1986 and June 1988, respectively. The FS report indicates that, although PERC is moving downgradient within the aquifer, the concentration reduction mechanisms of adsorption, dispersion, degradation, and dilution balance the landfill releases, which results in the observed stable contaminant distribution.

SUMMARY OF SITE RISKS

Persons who may use contaminated groundwater from the area of the Northside Landfill as their only source of water were identified as the population at risk of adverse health effects. The primary routes of exposure to contaminants in groundwater are ingestion, inhalation of volatile constituents, and dermal absorption. Tetrachloroethylene, (PERC), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) detected in groundwater from offsite wells are the contaminants of concern. The maximum cancer risk from exposure to groundwater from the most contaminated private well is one in ten thousand (1×10^{-4}). Non-carcinogenic health effects are not expected from exposure to PERC and TCA at the present detected level of contamination in onsite and offsite wells.

Identification of Contaminants of Concern

The Remedial Investigation/Feasibility Study (RI/FS) identified groundwater as the exposure medium of greatest concern. Exposure via other media including soil and surface water was not considered to be significant. Thus, groundwater is the only exposure medium considered here.

The RI/FS identified PERC, TCE, and TCA as the contaminants of concern. These were the only organic compounds regularly detected in the offsite wells. Groundwater monitoring data from Appendix D of the Supplemental RI Addendum were used to calculate exposure point concentrations for the exposure scenarios described below.

Three hypothetical exposure scenarios were evaluated: (1) average exposure due to use of an offsite well, (2) exposure due to use of one of the most contaminated offsite wells, and (3) exposure due to use of one of the most contaminated onsite wells. The exposure point concentrations used to calculate risk estimates are described in the following paragraphs and are also listed in Tables 2-4.

For average exposure due to use of an offsite well, it was assumed that persons would be exposed to groundwater contaminants at a level equal to the mean of all the observations over time for all of the offsite wells. For PERC, TCE, and TCA, these concentrations are 3, 1, and 1 ug/l, respectively.

For exposure due to use of the one of the most contaminated offsite wells, the Pellow and Volkman Wells were identified as the two most contaminated wells. Two concentration levels of contaminants were considered at each of these wells: the average concentration at the wells and the highest concentration observed at the wells. At the Pellow Well, the average concentrations of PERC, TCE, and TCA are 28, 5, and 4 ug/l, respectively. The highest concentrations of PERC, TCE, and TCA observed at this well are 38, 8, and 10 ug/l, respectively. At the Volkman Well, the average concentrations of TCE and TCA are 1 and 7, respectively. The highest concentrations of TCE and TCA observed at this well are 7 and 15 ug/l, respectively. PERC was not detected in this well and therefore 0.5 ug/l (half the detection limit) was used as the average and maximum value.

In order to evaluate exposure due to use of one of the most contaminated onsite wells, the same approach was used as for offsite wells. The most

TABLE 2

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM AVERAGE EXPOSURE DUE TO USE OF AN OFFSITE WELL

	Oral	Inhalation	Dermal
TCE			
Concentration (ug/l)	1	1	1
Risk	3×10^{-7}	3×10^{-7}	1×10^{-9}
PERC			
Concentration (ug/l)	3	3	3
Risk	4×10^{-6}	4×10^{-6}	2×10^{-8}
Total Excess Risk	1×10^{-5}	(Sum of risks due to three exposure routes and both chemicals)	

TABLE 3

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM
EXPOSURE DUE TO USE OF THE MOST CONTAMINATED OFFSITE WELLS

Pellow Well	Average Case			Upper-bound Case		
	oral	inhalation	dermal	oral	inhalation	dermal
TCE						
Concentration (ug/l)	5	5	5	8	8	8
Risk	2×10^{-6}	2×10^{-6}	1×10^{-5}	3×10^{-6}	5×10^{-6}	1×10^{-8}
PERC						
Concentration (ug/l)	28	28	28	38	38	38
Risk	4×10^{-5}	4×10^{-5}	2×10^{-7}	6×10^{-5}	1×10^{-4}	2×10^{-7}
Total Excess Risk	8×10^{-5}	(Sum of risks due to three routes and both chemicals)		2×10^{-4}	(Sum of risks due to three routes and both chemicals)	

Volkman Well	Average Case			Upper-bound Case		
	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
TCE						
Concentration (ug/l)	1	1	1	7	7	7
Risk	3×10^{-7}	3×10^{-7}	1×10^{-9}	2×10^{-6}	4×10^{-6}	8×10^{-9}
PERC						
Concentration (ug/l)	.5	.5	.5	.5	.5	.5
Risk	7×10^{-7}	7×10^{-7}	3×10^{-9}	7×10^{-7}	1×10^{-6}	3×10^{-9}
Total Excess Risk	2×10^{-6}	(Sum of risks due to three routes and both chemicals)		1×10^{-5}	(Sum of risks due to three routes and both chemicals)	

TABLE 4

ESTIMATED DOSES AND INCREMENTAL CANCER RISKS FROM
EXPOSURE DUE TO USE OF THE MOST CONTAMINATED ONSITE WELLS

Well MW-M	Average Case			Upper-bound Case		
	oral	inhalation	dermal	oral	inhalation	dermal
TCE						
Concentration (ug/l)	13	13	13	22	22	22
Risk	4×10^{-6}	4×10^{-6}	2×10^{-8}	7×10^{-6}	1×10^{-5}	3×10^{-8}
PERC						
Concentration (ug/l)	14	14	14	26	26	26
Risk	2×10^{-5}	2×10^{-5}	8×10^{-8}	4×10^{-5}	8×10^{-5}	1×10^{-7}
Total Excess Risk	5×10^{-5}	(Sum of risks due to three routes and both chemicals)		1×10^{-4}	(Sum of risks due to three routes and both chemicals)	

Well MW-I	Average Case			Upper-bound Case		
	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal
TCE						
Concentration (ug/l)	4	4	4	4	4	4
Risk	1×10^{-6}	1×10^{-6}	5×10^{-9}	1×10^{-6}	3×10^{-6}	5×10^{-9}
PERC						
Concentration (ug/l)	33	33	33	33	33	33
Risk	5×10^{-5}	5×10^{-5}	2×10^{-7}	5×10^{-5}	1×10^{-4}	2×10^{-7}
Total Excess Risk	1×10^{-4}	(Sum of risks due to three routes and both chemicals)		1×10^{-4}	(Sum of risks due to three routes and both chemicals)	

contaminated onsite wells were identified as monitoring wells MW-M and MW-T. At the MW-M Well, the average concentrations of PERC, TCE, and TCA are 14, 13, and 6 ug/l, respectively. The highest concentrations of PERC, TCE, and TCA observed at this well are 26, 22, and 15 ug/l, respectively. MW-T Well was sampled only once in June 1988. The concentrations of PERC, TCE, and TCA detected in this well are 33, 4, and 18 ug/l, respectively.

Four other organic compounds--chloroform, 1,2-transdichloroethylene, 1,1-dichloroethane, and vinyl chloride--were detected on a few occasions in less than 30% of the offsite wells. Vinyl chloride, for example, was analyzed on only one occasion and was detected only in the Pellow, MW-M, and MW-T Wells at 1 ug/l. Chloroform was sampled for regularly in each well, but was detected in only 3 wells, on one occasion in each well (maximum concentration = 6 ug/l detected in the Costello Well, October 1987). These chemicals were therefore not evaluated in the risk assessment, because they were detected so infrequently and at very low concentrations relative to their toxicity (often near the detection limit of 1 ug/l). However, because of the weight of evidence and cancer potency of vinyl chloride and chloroform, the maximum likely additional cancer risks due to exposure to these chemicals are discussed in the uncertainty section.

Iron was the only inorganic compound detected in offsite wells that exceeded drinking water standards. The ambient water quality criterion for iron (0.3 mg/l) is based on taste, odor, and staining properties. This compound was not considered a contaminant of concern because there are no known health effects from ingestion of iron at the concentrations measured.

Exposure Assessment

The population at greatest risk of adverse health effects are those people who potentially use the groundwater in the area of the Northside Landfill as their only source of drinking water. The primary routes of exposure to contaminants in groundwater are ingestion, inhalation of volatile constituents, and dermal absorption.

A. Exposure Point Concentrations

As mentioned above, groundwater monitoring data from Appendix D of the Supplemental RI Addendum were used to derive exposure point concentrations. Appendix D contains organic chemical concentration data for samples taken during the period of September 1983 through June 1988 for onsite and offsite wells. Most wells were sampled periodically during this period and so a time series of data is available for these wells. Some wells were sampled only once or very infrequently during this period.

A great number of analytical results are reported as below a detection limit of 1 microgram per liter or as below an unspecified detection limit. When calculating exposure point concentrations for PERC, TCE and TCA, these "non-detectable" results were treated in the following manner. If a result was reported as less than 1 microgram per liter, then it was assumed that the concentration equals one-half of the detection limit, i.e., 0.5 ug/l. If a result was reported as less than an unspecified detection limit, it was assumed that the detection limit is 1 microgram per liter, and that the concentration equals 0.5 ug/l.

1) Average Exposure Due to Use of Offsite Wells

In this scenario, it was assumed that persons would be exposed to groundwater contaminants at a level equal to the arithmetic mean of all the observations (N = 523) averaged over time for all of the offsite wells (total = 61). For PERC, TCE, and TCA, these concentrations are 3, 1, and 1 ug/l, respectively.

2) Exposure Due to Use of the Most Contaminated Offsite Well(s)

For this scenario, for each of the three chemicals of concern, the offsite well which showed the highest average concentration was identified. The average concentration at a well is defined as the arithmetic mean of the time series of concentration data.

For PERC, the Pellow Well showed the highest average concentration (28 ug/l based on 24 observations). The average concentration of PERC at all other offsite wells is less than 9 ug/l.

For TCE as well, the Pellow Well showed the highest average concentration (5 ug/l based on 24 observations). The average concentration of TCE at all other offsite wells is less than 2 ug/l.

For TCA, the Volkman Well showed the highest average concentration (7 ug/l based on 31 observations). The average concentration of TCA at the Pellow and Shaw Wells was 4 ug/l. At all other offsite wells, the average concentration of TCA is less than 2 ug/l.

The Pellow and Volkman Wells were therefore identified as the most contaminated wells. Risks associated with the exposure to groundwater contaminants from the both these wells are evaluated assuming two levels of exposure. The first level is the average concentration at the wells. These concentrations are given in the paragraphs above.

The second level considered is the highest concentration observed at the wells. At the Pellow Well, the highest observed concentrations of PERC, TCE, and TCA are 38, 8, and 10 ug/l, respectively. At the Volkman Well, the highest observed concentrations of TCE and TCA are 7 and 15 ug/l, respectively. PERC was assumed to be at a concentration of 0.5 ug/l, as it was not detected in this well.

3) Exposure Due to Use of the Most Contaminated Onsite Wells

For this scenario, for each of the three chemicals of concern, the onsite well which showed the highest average concentration was identified. The average concentration at a well is defined as the arithmetic mean of the time series of concentration data.

For PERC, the MW-T Well showed the highest average concentration (33 ug/l based on 1 observation in June 1988).

For TCE, the MW-M Well showed the highest average concentration (13 ug/l based on 16 observations).

For TCA, the MW-T Well showed the highest average concentration (18 ug/l based on one observation in June 1988).

The MW-M and MW-T Wells were therefore identified as the most contaminated wells. Risks associated with the exposure to groundwater contaminants from both these wells are evaluated assuming two levels of exposure. The first level is the average concentration at the wells. These concentrations are given in the paragraphs above.

The second level considered is the highest concentration observed at the wells. At the MW-M Well, the highest observed concentrations of PERC, TCE, and TCA are 26, 22, and 15 ug/l, respectively. At the MW-T Well, the only observed concentrations of PERC, TCE, and TCA are 33, 4, and 18 ug/l, respectively.

B. Calculation of Dose

For each chemical of concern, an average daily dose was calculated for two routes of exposure, ingestion and dermal contact. A dose from inhalation of volatile organic compounds, such as the chemicals of concern, was not calculated directly, as the various models for estimating risks from inhalation exposure have not been critically reviewed by the EPA, Region 10. Therefore, in this risk assessment it was assumed that the inhalation risks are equal to (average case) or two times (upper-bound case) the risks from ingestion of 2 liters of water per day, according to current EPA, Region 10 guidelines (USEPA, 1989a).

The average daily dose (mg/kg/day) via ingestion was calculated as follows:

dose = concentration of contaminant (mg/l) x intake rate (l/day) / 70 kg body weight

For all exposure scenarios, a person was assumed to ingest 2 liters of contaminated water every day for a lifetime. Absorption was assumed to be 100% for all chemicals.

The average daily dose from dermal absorption of contaminants while bathing was calculated as follows:

dose = C x CF x Kp x SA x EF / 70 kg body weight

where,

C = concentration of contaminant (mg/l)
CF = conversion factor (10^{-3} l/cm^3)
Kp = dermal permeability constant (cm/hr)
SA = body surface area contacted (cm^2)
EF = frequency (hr/day)

For all the volatile contaminants, a dermal permeability constant of 8.4 x 10^{-4} cm/hr was used in the above equation (USEPA, 1989c). The body surface area exposed to water while bathing was assumed to be 18,000 cm^2 for the average adult (USEPA, 1989b). For each exposure scenario, a person was assumed to bathe for a duration and frequency equivalent to one-half hour every day for a lifetime.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic and non-carcinogenic effects due to exposure to site chemicals are considered separately. Criteria for evaluating the potential of site chemicals to cause these two types of adverse effects are described below.

A. Criteria for Non-Carcinogenic Effects

The acceptable daily intake for chronic exposure (ADI) is an estimate of the highest human intake of a chemical, expressed as mg/kg/day, that does not cause adverse effects when exposure is long-term (lifetime). ADI values are based on animal or human toxicity studies from which a no-observed-adverse-effect level (NOAEL) is experimentally determined. The NOAEL is the highest dose at which there was no statistically or biologically significant adverse effect observed. The ADI is derived by dividing the NOAEL from the selected study by an uncertainty factor. The uncertainty factor consists of multiples of 10 to account for specific areas of uncertainty in the available data. For example a total uncertainty factor of 1,000 may be used to account for; use of a subchronic (short-term) study (10), for extrapolation from animals to humans (10), and for protection of sensitive human populations (10).

When the EPA completes verification of the chronic toxicity of a specific chemical, it establishes a "reference dose" or RfD. If the RfD for a chemical has been established, then the RfD is used as the ADI for evaluating long-term non-carcinogenic risks at the site.

The dose calculated from the exposure assessment is compared to the RfD to determine whether adverse effects might occur. If predicted exposure concentrations are below the level of the RfD, no adverse health effects are expected according to current EPA guidelines.

The oral RfDs for PERC and TCA are 0.01 and 0.09 mg/kg/day, respectively, each calculated with an uncertainty factor of 1,000 (USEPA, 1988). The RfD for PERC is based on observations of liver toxicity in mice, including increased liver weight/body weight ratios, changes in liver enzyme levels, and necrosis (death of liver tissue). Increases in liver and kidney weight/body weight ratios have been observed in rats, also. The RfD for TCA is based on fatty changes in the liver and increased liver weights in guinea pigs exposed via inhalation. Non-carcinogenic health effects of TCE are similar to those of PERC and TCA; however, an oral RfD for TCE is not currently available and therefore not evaluated here.

RfDs for dermal absorption have not yet been determined by the EPA. However, for volatile organic compounds, such as the chemicals of concern at the Northside Landfill, current EPA policy is to use the oral RfD in calculating the hazard index for dermal exposure. The hazard index is the ratio between route-specific calculated dose and the RfD. Ratios exceeding unity (one) indicate doses that exceed the acceptable levels; ratios less than one are not expected to cause adverse health effects. One of the assumptions in using an oral RfD is that 100% of the chemical was absorbed via the route investigated in the study that was used to derive the oral RfD. This is a reasonable assumption for a dermal RfD for the chemicals of concern at this site.

As noted previously, risks from inhalation exposure were not calculated directly, but assumed to be equal to (average case) or two times (upper-bound case) the risks from ingestion of 2 liters of water per day, according to EPA guidelines (USEPA, 1989a).

B. Criteria for Carcinogenic Effects

The EPA uses a weight-of-evidence system to convey how likely a chemical is to be a human carcinogen, based on epidemiological studies, animal studies, and other supportive data. The classification system of the EPA for characterization of the overall weight of evidence for carcinogenicity includes: Group A- Human Carcinogen; Group B- Probable Human Carcinogen; Group C- Possible Human Carcinogen; Group D- Not Classifiable as to Human Carcinogenicity; and Group E- Evidence of Non-Carcinogenicity for Humans. Group B is subdivided into two groups: Group B1- limited human evidence for carcinogenicity; and Group B2- sufficient data in animals, but inadequate or no evidence in humans.

TCA is currently in Group D, not classifiable as to human carcinogenicity, and therefore was not evaluated for carcinogenic risks. PERC and TCE are currently classified as probable human carcinogens by the EPA, Group B2. However, the status of these compounds and their respective cancer potency factors is now under review.

For PERC, the review concerns whether this chemical is most appropriately classified in Group B2 or C. Evidence of liver tumors (in both sexes of mice by two routes of administration), leukemia in rats, and renal carcinomas in male rats, along with supportive metabolic considerations, provide a basis for classifying PERC in Group B2. However, mutagenicity data have in general been negative or inconclusive. Furthermore, the relevance of mouse liver tumors to human cancer risk is still in question. PERC would therefore be classified as Group C, possible human carcinogen, if one accepts the weighting of the animal evidence to be limited.

For chemicals with carcinogenic effects, EPA calculates the cancer risk associated with a given dose by multiplying the dose from a given route of exposure by a cancer potency factor or potency slope. The EPA derives potency factors from the upper 95% confidence limit of the slope of the extrapolated dose-response curve, which shows the relationship between a given dose and the associated tumor incidence. As a result, the predicted cancer risk is an upper-bound estimate of the potential risk associated with exposure.

The present oral cancer potency factors for PERC and TCE are 5.1×10^{-2} and 1.1×10^{-2}, respectively (USEPA, 1988). There are no cancer potency factors for dermal absorption. However, for volatile organic compounds, such as the chemicals of concern, current EPA policy is to use the oral potency slope in calculating cancer risk from dermal exposure.

Risk Characterization

A. Carcinogenic Risks

Estimates of carcinogenic risks for the three exposure scenarios considered are presented in Tables 2, 3, and 4. These risks are the estimated lifetime incremental upper-bound risks of developing cancer as a result of

being exposed to PERC and TCE under the assumed conditions. The risks associated with exposure to each chemical via oral, inhalation, and dermal exposures routes are given. Also, total excess risk values are shown for each scenario. Total excess risk values are calculated by adding the risks due to exposure to both chemicals by all three exposure routes.

Table 2 shows the estimated cancer risks based on an average exposure to PERC and TCE due to use of an offsite well. The total excess risk is 9×10^{-6} for this scenario. This number represents an increased risk of contracting cancer of nine chances in one million for a person exposed for 70 years.

Estimated cancer risks based on exposure to PERC and TCE due to use of the most contaminated offsite wells (the Pellow and Volkman Wells) is shown in Table 3. For each of these wells, exposure to the average and maximum concentrations of each chemical observed at the well was considered (average and upper-bound cases, respectively). For the Pellow Well, total excess risks are estimated to be 8×10^{-5} and 2×10^{-4} assuming exposure to average and maximum concentrations, respectively. For the Volkman Well, total excess risks are estimated to be 2×10^{-6} and 9×10^{-6} assuming exposure to average and maximum concentrations, respectively.

Table 4 shows the estimated cancer risks based on exposure to PERC and TCE due to use of the most contaminated onsite wells (the MW-M and MW-T Wells). For Well MW-M, the same two levels of exposure were considered as for the offsite wells. Total excess risks are estimated to be 5×10^{-5} and 1×10^{-4} assuming exposure to average and maximum concentrations, respectively. For the MW-T Well, the total excess risk is 1×10^{-4} for both the average and upper-bound exposure calculations, based on the single available observation.

B. Non-Carcinogenic Risks

Non-carcinogenic risks are presented as a hazard index which is the ratio between the route-specific calculated dose and the RfD. Ratios exceeding unity (one) indicate doses that exceed the acceptable level; ratios less than one are not expected to cause adverse health effects.

Based on the highest observed concentrations of PERC and TCA, the Pellow and MW-T Wells were the offsite and onsite wells, respectively, found to pose the greatest risk of non-carcinogenic effects. The estimated doses of each chemical, based on the maximum observed concentration, and the corresponding hazard index are presented below for the Pellow and MW-T Wells.

Pellow Well	PERC (mg/kg/day)	TCA (mg/kg/day)
Oral Dose	1.1×10^{-3}	2.9×10^{-4}
Inhalation Dose	2.2×10^{-3}	5.7×10^{-4}
Dermal Dose	4.1×10^{-6}	1.1×10^{-6}
Total Dose (A)	3.3×10^{-3}	8.6×10^{-4}
RfD (B)	1.0×10^{-2}	9.0×10^{-2}
Hazard Index (A/B)	0.30	0.01

MW-T Well	PERC (mg/kg/day)	TCA (mg/kg/day)
Oral Dose	9.4×10^{-4}	5.1×10^{-4}
Inhalation Dose	1.9×10^{-3}	1.0×10^{-3}
Dermal Dose	3.6×10^{-6}	1.9×10^{-6}
Total Dose (A)	2.8×10^{-3}	1.5×10^{-3}
RfD (B)	1.0×10^{-2}	9.0×10^{-2}
Hazard Index (A/B)	0.30	0.02

The hazard indices for both chemicals may be totaled as PERC and TCA have similar toxic endpoints. The total hazard indices for the Pellow and MW-T Well are 0.34 and 0.30, respectively. As these hazard indices are below unity, non-carcinogenic health effects are not expected from exposure to PERC and TCA in these two wells. The risk from exposure to PERC and TCA in other wells would be less, as the Pellow and MW-T Wells have the highest concentrations of these contaminants. Thus no non-carcinogenic effects are expected due to exposure to these chemicals in any well.

C. Uncertainty

The accuracy of the risk characterization depends in large part on the quality and representativeness of the available sampling, exposure, and toxicological data.

One major area of uncertainty that may have underestimated health risks is that cancer risks from exposure to chloroform and vinyl chloride were not evaluated in this study. These chemicals were detected very infrequently and the RI/FS determined there was insufficient data to evaluate them. However, vinyl chloride is classified as a human carcinogen, Group A, and chloroform is classified in Group B2, probable human carcinogen. Because of their inherent toxicity, likely maximum additional increases in cancer risk from exposure to vinyl chloride and chloroform were therefore calculated. Using the highest single concentration detected for vinyl chloride (1 ug/l) and an oral cancer potency slope of 2.3 (USEPA, 1989d), the upper-bound estimate of additional cancer risk is 2×10^{-4}. For chloroform, the upper-bound estimate of additional cancer risk is 3×10^{-6}, based on the highest observed concentration (6 ug/l) and an oral cancer potency slope of 0.0061 (USEPA, 1988). Because these chemicals are degradation products of the other chlorinated organics, vinyl chloride and chloroform levels could rise and pose risks greater than the above estimates.

D. Conclusions

In conclusion, the total incremental increase in cancer risk for the average exposure scenario is 9×10^{-6}. For exposure to one of the offsite wells with the highest average concentration of carcinogens, cancer risks range from 2×10^{-6} to 1×10^{-4}. Estimated cancer risks from exposure to groundwater from the most contaminated onsite wells range from 5×10^{-5} to 1×10^{-4}. These scenarios are based on the assumption that the population at risk is using groundwater near the Northside Landfill as the only source of drinking water over an entire lifetime (70 years). Non-carcinogenic health effects are not expected from exposure to PERC and TCA at the present level of contamination in onsite and offsite wells.

DESCRIPTION OF ALTERNATIVES

The goal of the remedial actions is to prevent, reduce, or control the contaminants leaving the landfill and entering the groundwater. Technically applicable technologies were identified in the FS for each of the units. Most of the remedial actions that passed the screening process for one of the landfill solid waste units (refuse, skimmings, old burn, or sewage sludge) passed for all of the other three. The aquifer unit includes different technologies that deal with the migration of the contaminants in groundwater and not the material in the refuse. The description of the treatment alternatives is divided into those for the landfill units and those for the aquifer unit.

Landfill Units

Remediation of the landfill units must control, as far as possible, the leaching of contaminants into the groundwater. This may be done by either:

a) capping the landfill to eliminate leaching;
b) diverting stormwater so that it does not generate leachate; or
c) excavating the landfill and removing the contaminated waste.

If it proves impracticable to control leachate, administrative restrictions may be enacted to reduce exposure to contaminants. Another alternative considered is to take no action.

a) Capping. The cap system would consist of multiple layers, including topsoil, soil cover, drainage layers, and bedding/protection layers, in conjunction with a low permeability, barrier layer to control infiltration. Around the perimeter of the cap, collection ditches would be installed to intercept stormwater runoff and convey it to appropriate points of discharge. Three different types of cap systems were considered: synthetic membrane, synthetic membrane and clay, and soil/bentonite.

   The cap would utilize proven technologies. Its main advantage is that it restricts the amount of leachate that can enter the aquifer unit by reducing the infiltration of precipitation into the landfill. Precipitation is the principal source of leachate generation for the landfill because it is located above the identified groundwater tables. Therefore, if precipitation, run-on, and any lateral flows from the hillside can be kept from entering the waste, the health and environmental hazards associated with leachate generation and contamination of the aquifer unit would be significantly reduced.

   Disadvantages of capping include the waste of concern remaining onsite, the potential for the cap to leak and generate additional leachate, and the magnitude of grading and covering 345 acres of land. Leakage of the cap is a concern because of the potential for future leachate generation. The design and installation of the cap would need to be carefully done, and a maintenance program would be necessary to reduce the risk of leaks developing in the system over

time. Environmental impacts of the cap installation are considered temporary because the existing surface topography would not change significantly and vegetation would be reestablished.

Capping, of course, presupposes the closure of the landfill. Three of the units--old burn, sewage sludge, and skimmings--are no longer in use and could be capped at any time, but the refuse unit currently is scheduled to remain in use until December 31, 1991, when the waste-to-energy treatment system becomes operational. Any refuse taken to the Northside site after December 31, 1991, will be required to be placed into a new disposal unit which meets the state's Minimum Functional Standards (MFS) requirements.

ARARs

The closure and capping alternative include action-specific applicable or relevant and appropriate requirements (ARARs). The primary ARAR is the Washington State Minimum Functional Standards for Performance (MFS) (WAC 173-304-460). The MFS are applicable to landfills that institute closure after November 27, 1989. The Northside Landfill will be operating beyond 1989.

The MFS include requirements for the final cover, groundwater monitoring, landfill gas monitoring and control, runoff and leachate control, a closure plan, and a closure cost estimate.

The wastes in the landfill are not currently classified as hazardous wastes under RCRA because the only sources identified are small quantity generators. Since closure and capping do not include the placement of RCRA hazardous wastes, those RCRA regulations would not apply.

There are no chemical-specific or location-specific ARARs identified for this alternative.

b) Surface Water Diversion and Collection Systems. These systems are designed to divert and collect stormwater runoff and keep it from infiltrating the landfilled wastes, thereby reducing the potential for leachate generation. The diversion and collection systems would consist of ditches, culverts, and pipelines that collect runoff from flow concentration areas and convey it to an appropriate point of discharge. The ditches would be lined to ensure that infiltration would be minimized.

This alternative's chief advantages are that it would consistently help reduce leachate-generating precipitation from entering the landfill, and it is low in cost. The disadvantage is that it does not address infiltration by precipitation that falls within the landfill boundaries.

In the final analysis of alternatives, surface water diversion is not considered a separate alternative, but rather a component of capping, and is included as part of that alternative.

c) Excavation and Offsite Disposal. One additional remedy passed screening for the Skimmings Unit only. It was rejected for the refuse unit because of high cost and EPA preference for onsite remedies (the old burn and sewage sludge units have low contaminant levels and disproportionately

higher costs). This alternative entails total removal of grease skimmings (though not any contaminated soil) which would then be disposed of offsite at a permitted hazardous waste landfill. As this is an offsite activity, such disposal must comply with all applicable hazardous and solid waste disposal requirements. These include RCRA and the state Dangerous Waste and solid waste regulations.

d) Excavation and Onsite Treatment. Treatment onsite is either through land treatment or incineration. Land treatment is described as biological treatment of the waste done onsite but not in-situ. This meets EPA's preference for onsite treatment.

The chief advantages of this alternative are its permanent elimination of one potential contaminant source, its elimination of the health hazard for this area of the site, and the fact that it restores the area for possible future use. No administrative restrictions would be necessary after excavation and treatment were completed.

Disadvantages of this alternative include health and safety impacts associated with excavation, environmental concerns (e.g., worker exposure to contaminants during excavation and treatment), demonstrated effectiveness, and cost.

ARARs

Several action-specific ARARs are identified for excavation and treatment alternatives evaluated for the Skimmings Unit area within the landfill.

The skimmings originated from the city's wastewater treatment plant and are not RCRA hazardous wastes or state dangerous wastes either by definition or by characteristic.

Any contaminated soils not excavated can be treated as a non-disturbed solid waste unit (not hazardous) and capped according to applicable regulations.

Excavation of the skimmings could also be expected to result in the release of some quantity of volatile organics. There are currently no standards for PERC emissions, so any requirements would be determined by risk assessments which are not ARARs, but are "to be considered" in design of the remedial action.

Excavation and onsite treatment of the skimmings includes two treatment options. Both options include the excavation of the grease skimmings followed by treatment and placement back onsite. Land treatment of the skimmings has no applicable regulations. However, the disposal of any hazardous wastes generated as a result of the treatment process would be required to meet the RCRA disposal requirements, which would be applicable to this new waste's disposal.

The incineration of the skimmings has relevant and appropriate RCRA requirements for the operation and disposal of the waste streams. Although the incoming waste is not RCRA regulated, the RCRA ash and air emissions requirements for incineration would be relevant and appropriate because of the PERC concentrations in the waste.

There were no chemical-specific or location-specific ARARs identified for the excavation alternatives.

For the excavation with offsite disposal alternative, the RCRA hazardous waste regulations are not applicable because the skimmings are not a RCRA waste. However, offsite activities, such as disposal, will be regulated by applicable laws and regulations, and are not subject to ARAR analysis. For example, the transportation and packaging of the skimmings as a hazardous solid waste because of the PERC content is regulated by the U.S. Department of Transportation.

d) Administrative Restrictions. This would involve restricting land use with respect to future onsite excavation and construction.

The chief advantages of this alternative are its low cost and ease of implementation. Public health would be protected by reducing exposure to the contaminants at the site.

The primary disadvantage is that administrative restrictions would not be effective in eliminating or reducing public health concerns offsite. Infiltration would not be reduced nor surface water or groundwater flow controlled; thus the leachate would continue to be produced. The MFS, which is an ARAR and requires landfill capping, would not be met.

e) No Action. The landfill would be left in its current condition without any remedial action being taken. There would be no cost, but public health would not be protected. ARARs would not be met.

Aquifer Unit

For this unit, the remedial objective is to reduce health risks from the contaminants in the groundwater. Alternatives include:

a) extracting and treating the contaminated water;
b) monitoring;
c) administrative restrictions;
d) providing an alternate water supply; and
e) no action.

a) Collection Wells, Treatment, and Discharge. The purpose of the extraction and treatment system is to reduce and control the release of contaminants into the aquifer downgradient from the landfill. The aquifer unit alternative includes six variations using two extraction options for the contaminated groundwater and three treatment levels for each extraction design.

The two extraction (pump) options are extracting the entire contaminated plume (total plume capture) and extracting only a portion of the contaminated plume (partial plume capture). The total plume capture system uses extraction wells across the entire width of the contaminated plume and would be designed to extract groundwater with any amount of contamination for treatment. This would include pumping large volumes of groundwater that is currently contaminated at levels below the protective requirements. The partial capture system would extract only that groundwater that is contaminated at concentrations greater than existing

standards. This would reduce the amount of water that would need to be pumped and subsequently the volume that would be treated.

The difference between the two capture options, besides the amount of water pumped, is the amount of control over the release of contaminants downgradient from the system. This would have an impact on the time needed for recovery of the contaminated plume downgradient. Both options would control releases downgradient of the extraction system so that they would meet drinking water ARARs and protectiveness requirements in the aquifer. The design of the extraction system will determine where the actual extraction wells will be located.

The extracted contaminated groundwater would then be treated or discharged into the city's wastewater treatment plant for treatment and then discharged into the Spokane River. Three levels of treatment have been identified in the FS, which are: no treatment, treatment to drinking water levels and Ambient Water Quality Criteria (AWQC) levels, or treatment to background levels.

All of the pump and treat alternatives would also require groundwater monitoring, administrative restrictions, and an alternative drinking water supply. There would be minimal environmental impact during well construction and few anticipated health or safety concerns for the surrounding community.

ARARs

The ARARS are essentially the same for the two extraction alternatives. The major regulations that contribute to the list of potential chemical-specific ARARs are the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and the Water Quality Standards for the State of Washington (WAC-173-201) (90.48 RCW). The acts are under the jurisdiction of and are enforced by the Washington State Department of Health Services, the Washington State Department of Ecology (Ecology), and EPA.

The SDWA Maximum Contaminant Level (MCL) standards are enforceable standards that are applicable to surface water or groundwater that can be classified as a source or potential source of drinking water. The MCLs are applicable to any action that affects the concentration of contaminants in groundwater which is a source of drinking water, such as the SVRPA.

The discharge of extracted water to the Spokane River is considered to be offsite and is therefore not subject to ARARS analysis. Compliance with the applicable laws, regulations, and permit requirements is necessary. Some discussion of the discharge requirements is included since treatment may be done onsite.

The CWA Ambient Water Quality Criteria (AWQC) are designed to protect aquatic life and human health. The state of Washington adopts the AWQC by reference into their water quality standards, so the AWQC are requirements for surface water discharges. Table 5 presents chemical-specific potential ARARs for water. The table is arranged by chemical compound.

TABLE 5
CHEMICAL-SPECIFIC ARARS AND TBCS FOR ORGANIC CONTAMINANTS
FOUND AT THE NORTH LANDFILL

Compound	Safe Drinking Water Act		Clean Water Act				Reference-Dose Based Criteria
					Consumption of		
	MCL	MCLG	Acute Toxicity	Chronic Toxicity	Fish and Water	Fish Only	
Chloroform	100[a]	-	28,900[b]	1,240[b]	0.19	15.7	350
1,1-Dichloroethane	-	-	-	-	0.94[c]	243[c]	4,500
1,2-(Trans)Dichloroethylene	-	-	11,600[b]	-	0.33[d]	1.85[d]	350
Tetrachloroethylene	-	0[e]	5,280[b]	450[b]	0.8	8.85	10
1,1,1-Trichloroethane	200	-	-	-	18,400	1,030,000	1,000
Trichloroethylene	5	-	45,000[b]	-	2.7	80.7	260
Vinyl Chloride	2	0	-	-	2.0	525	46[f] (13[f])

All units in µg/l.

[a] Criterion for total trihalomethanes (sum of chloroform, bromodichloromethane, dibromochloromethane, and bromoform).

[b] Lowest observed effect level.

[c] Criterion for chlorinated ethanes based on toxicity of 1,2-dichloroethane.

[d] Criterion for dichloroethylenes based on carcinogenicity of 1,1-dichloroethylene.

[e] Proposed October 1986.

[f] Longer term Health Advisory for adult and 10 kg child is the 46 and 13 µg/l, respectively. Lifetime Health Advisory not calculated.

Minimum treatment of the extracted groundwater with ultimate discharge to the Spokane River must comply with Ambient Water Quality Criteria (AWQC)(see Table 5). The quality of the untreated groundwater would not be expected to satisfy the AWQC for fresh water due to VOC concentrations. An NPDES permit would have to be obtained from Ecology prior to initiating the discharge. Discharges to the river will be required to comply with the phosphorus discharge limits established for the Spokane River. The alternative would also have to be analyzed for its effect on fish, wildlife, and habitat in and around the Spokane River as required by the Fish and Wildlife Coordination Act. No other location-specific natural resource ARARs were identified.

The extracted groundwater will be treated to meet drinking water standards for metals and volatile organic compounds or meet NPDES and AWQC requirements, whichever is more stringent, prior to discharge to the Spokane River. There would be some level of contamination remaining in the treated water discharged to the Spokane River.

The cost for the extraction and treatment alternatives would be moderate to high, depending on the number of wells and the specific treatment process selected.

b) Monitoring. The existing groundwater monitoring system would continue to be used until the long-term monitoring plan is developed and approved by EPA. This existing system consists of wells both on- and offsite which were installed at various depths to indicate the level of contamination.

Monitoring would be low in cost and easily implemented, since it could largely utilize an existing system which could be supplemented if the existing wells are determined to be inadequate. It would provide a means for measuring the effectiveness of other response actions. However, it would not in itself protect public health.

Groundwater monitoring for the purpose of early detection of contaminants beyond the existing plume area does not satisfy ARARs because the existing groundwater contaminant levels would continue to exceed drinking water MCLs within the plume.

c) Administrative Restrictions. Under this alternative, the city would prevent the installation of wells in the contaminated portion of the aquifer. Though all affected residences are now connected to the city water system, there are currently no regulations to make future residences connect with this system or prevent existing contaminated wells from being used.

This alternative would protect public health by limiting exposure to contaminated groundwater; it would be low in cost to implement. It would not reduce contamination, and ensuring compliance could be difficult.

Administrative restrictions to prevent use of the contaminated groundwater in the area of the plume do not satisfy ARARs because groundwater contaminant levels would continue to exceed drinking water MCLs for decades.

d) Alternative Water Supply. All new residences in the area of contamination would be connected with the municipal water system, as existing residences already are. It would be technically feasible since there are nearby water lines, though some new service laterals might have to be constructed. Public health would be protected and cost would be low, but the groundwater would remain contaminated. There were no environmental receptors of the contaminated groundwater identified in the FS.

An alternate source of drinking water for residents located in the local area of the contaminated plume does not satisfy ARARs. Groundwater contaminant levels would continue to exceed drinking water MCLs until natural recovery reduces the contaminants below the MCLs. This alternative would help in the interim to protect public health, but contamination would not be reduced to MCLs; therefore, it would not satisfy ARARs.

e) No Action. No remedial measures would be implemented, beyond those already in place (i.e., providing alternative water to existing residences). There would be no cost, no change in the level of protection of public health, and no reduction of contamination in the aquifer. Water quality and Safe Drinking Water Act ARARs would not be met.

COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance (U.S. EPA 1988) requires that each remedial alternative be evaluated according to specific criteria. The purpose of the evaluation is to identify the advantages and disadvantages of each alternative, and thereby guide selection of the remedy offering the most effective and feasible means of achieving the stated cleanup objective. While the nine CERCLA evaluation criteria are all important, they are weighted differently in the decisionmaking process depending on whether they describe a required level of performance (threshold criteria), technical advantages and disadvantages (primary balancing criteria), or overall evaluation by non-EPA reviewers that may affect an EPA decision (modifying criteria).

EPA evaluated the four landfill units together because they all had similar technologies that passed the screening step. The evaluation of the aquifer unit follows because it has different possible technologies than the landfill units. The nine evaluation criteria are:

Threshold criteria

1. Overall protection of human health and the environment
2. Compliance with ARARs

Primary balancing criteria

3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short-term effectiveness
6. Implementability
7. Cost

Modifying criteria

8. State acceptance
9. Community acceptance

Table 6 provides a summary of the alternative evaluation criteria.

Threshold Criteria

The remedial alternatives were first evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the candidate alternatives for further consideration as remedies for the ROD.

1. Overall Protection of Human Health and the Environment

This criteria addresses whether or not remedial action provides adequate protection or describes the mechanisms for controlling risk for the different exposure pathways.

TABLE 6

SUMMARY OF ALTERNATIVE EVALUATION CRITERIA

Remedial Alternative	Protection of Health and Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Short Term Effectiveness	Implementability
LANDFILL UNITS					
Capping	° Moderate to highly effective reduction of long-term health risks. ° Not effective for short term reduction of contamination entering the aquifer.	Applicable state and federal ARARs; can be designed to meet Requirements.	30+ yrs. useful life; Reduces effect of source on aquifer; Requires O&M	Contains the source & reduces some exposure routes.	Proven technology; 1 yr. to construct; substantial grading of steep slopes.
Excavation					
° Off Site Disposal	Highly effective, removes a source of contamination; possible short term risks to workers.	ARARs apply to all 3 options. ARARs can be met by proper design.	Effective source removal; residual in soils will leach	Effective source removal; residuals remain in soil.	Proven technology; takes 4-6 mos. to excavate and transport.
° On-site Treatment	Highly effective, long term & permanent but slow to implement; possible short term risk to workers.		Effectiveness unknown; residuals may exist which can leach.	Effectiveness unknown; requires treatability studies.	Innovative technology; requires treatability studies & may take 10 yrs. to implement.

TABLE 6 (cont'd)

SUMMARY OF ALTERNATIVE EVALUATION CRITERIA

Remedial Alternative	Protection of Health and Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Short Term Effectiveness	Implementability
° On-Site Incineration	Highly effective & permanent treatment; Possible short term risk from air emissions.		Effective removal; residuals will remain to leach.	Effective removal; residuals in soil remain.	Innovative technology; may require demonstration; 1 yr. to implement.
Administrative Restrictions	Low protection for exposure; no protection to groundwater.	Any new requirements must be constant with other laws and regulations.	Permanent remedy.	Effective reduction to human risk.	No limitations.
No Action	No reduction in risk.	Currently does not meet ARARs.	None	None	None
AQUIFER UNIT					
Pumping & Treatment	Highly effective in permanently reducing health & environmental risks.	Applicable state & federal ARARs. Treatment can be designed to meet discharge ARAR criteria.	Highly effective in controlling off-site migration. Useful life 20+ yrs. Requires O&M.	Highly effective in controlling downgradient migration	Proven technology; 2 yrs. to design and construct.

TABLE 6 (cont'd)

SUMMARY OF ALTERNATIVE EVALUATION CRITERIA

Remedial Alternative	Protection of Health and Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Short Term Effectiveness	Implementability
Administrative Restrictions	Moderately effective preventing future from construction of new wells.	Any new requirements must be consistent with existing ones.	Permanent remedy.	Reduces exposure to contaminated aquifer.	No limitations.
Groundwater Monitoring	No protection.	Meets ARARs.	Can be maintained for long term; Requires sampling and analysis.	Only measures contamination; no protection.	Proven technology; system in place.
Alternative Water Supply	Highly effective for short term and possible long term; Reduces use of contaminated aquifer.	Municipal water system currently meets ARARs.	Useful life is 50+ yrs. Highly effective system.	Highly effective at reducing health risks.	Proven technology; system in place.
No Action	No protection.	Currently does not meet ARARs.	Not effective; no reduction in risk.	No additional protection to use of groundwater.	None

Landfill Units

The most effective alternative for the landfill would be capping (incorporating a surface water collection system, as discussed previously). All of the landfill units include a capping alternative. These alternatives would take take about a year to implement and the effectiveness would show decreases in concentrations of compounds in the aquifer 5 to 10 years after completion. Capping is a containment technology because it controls the mobility of the contaminants through the waste material.

Under this remedy the wastes would remain onsite, but the potential for future leaching of contaminants into the groundwater would be reduced. Since leachate is considered the main source of groundwater contaminants, the prevention or reduction of leachate should result in gradual recovery of the groundwater. Since groundwater is the main exposure pathway for the site's contaminants, any alternative reducing groundwater contamination would substantially reduce the risk to public health. Although effects on non-human biota have not been studied at this site, presumably they too would be less at risk. The actual construction of the cap would have some environmental impact, but it would be minimized and temporary.

The most protective alternative evaluated for the Skimmings Unit, a small section of the landfill, would be excavation and treatment. Implementation would result in all contaminated wastes being either removed or rendered substantially less hazardous, thus reducing the threat to public health. However, this alternative would have more adverse effects on the environment during construction (e.g., noise, possible air exposure to contaminants) than any of the other alternatives.

Excavation and onsite land treatment or onsite incineration both are very protective since there is a reduction in the amount of contaminants after the cleanup goals are met. During the treatment processes and during excavation there would be slight, unquantifiable increases in short-term risk because of discharges of VOCs to the air during excavation, incineration and land treatment.

Administrative restrictions such as not allowing drinking water wells in the contaminated plume would limit exposure to contaminants, but would not reduce actual contamination, and so this alternative receives a low rating in terms of public health and environmental protection.

The no action alternative reduces neither the level of contamination nor public exposure to contaminants, and thus does not protect public health. The current environmental impact would continue.

Aquifer Unit

The total plume capture alternative described in the FS would pump and treat the entire contaminated plume at the boundary of the landfill, thus reducing the risk from any groundwater use downgradient. The partial plume capture alternative as described in the FS would pump and treat the contamination that is above MCLs at the landfill boundary and reduce the

concentration of contaminants of concern to below drinking water standards. Under both capture options the groundwater leaving the landfill would meet the MCLs for the aquifer. This would reduce the risks downgradient from the landfill and eventually allow full use of the aquifer again. The treatment facilities described in the FS for both of these alternatives would produce air emissions from the volatile organic compounds removed from the groundwater. The exposure to these air emissions would be below health based criteria because concentrations are expected to be below detection limits at exposure points. Discharge of treated groundwater to the Spokane River would increase the amount of measurable compounds reaching the river. Treatment will reduce the discharge concentrations to meet health based and receiving water quality standards.

Administrative restrictions would restrict future well drilling and existing well usage in the area of the contamination plume and thus reduce the potential for consumption of contaminated water. This would provide limited human health protection, and no protection to the environment.

An alternative water supply would also limit (but not eliminate) human exposure to contaminated groundwater, and would not protect the environment.

Groundwater monitoring would not in itself protect public health or the environment, though it would provide evidence of future changes in health risk from the groundwater.

The no action alternative would involve no technical or administrative remedial action. There would be no protection of human health or the environment.

2. Compliance with ARARs

The purpose of this analysis is to identify applicable or relevant and appropriate requirements (ARARs) that may be major components of the remedial actions and to evaluate the alternatives for compliance with the ARARs and those criteria to be considered (TBCs) in the evaluation, such as certain health based risk assessments to help determine what is protective.

Landfill Units

Excavation of the skimmings from the Skimmings Unit could be expected to result in the release of some quantity of volatile organics. Although the concentration would be expected to be low, risk assessments for VOCs should be consulted. The offsite disposal portion of this alternative is not subject to ARARs evaluation.

The excavation and onsite land treatment alternative shares the above requirements relating to the excavation of the wastes. However, no ARARs have been identified for this alternative because the skimmings are not considered a hazardous or dangerous waste and no hazardous waste by-products are expected. Land treatment has some "to be considered" state guidance for the skimmings wastes which will require that monitoring be incorporated to ensure the protection of underlying

groundwater. State laws require control or collection of surface water runoff will be needed to prevent offsite migration of contaminants. The release of volatile organic compounds will be enhanced by land treatment. This emission source will need to be evaluated as "to be considered" with respect to air pollution source criteria or risk analyses.

Incineration of the skimmings includes some special ARARs for the Skimmings Unit. The RCRA requirements would be relevant and appropriate for incineration, due to the concentration of PERC in the waste. The requirements relating to the excavation of the wastes and the containment of site run-off are similar to offsite disposal and onsite treatment. The onsite incinerator would be required to comply with RCRA hazardous waste incineration requirements for hazardous or dangerous waste. These include emissions monitoring and control, wastewater treatment, and disposal of ash and solids from the emission control and wastewater treatment processes.

Capping the landfill has the same ARAR analysis for all landfill units. The wastes in the landfill have not been classified as hazardous or dangerous wastes; therefore, the primary ARAR will be the Washington State Minimum Functional Standards for Performance (MFS)(WAC 173-304-460). The MFS will be applicable to existing facilities that institute closure after November 27, 1989. The projected operating life of the Northside Landfill is beyond 1989. The MFS include requirements for the final cover, groundwater monitoring, landfill gas monitoring and control, surface water, runoff and leachate control, a closure plan, and closure cost estimate. RCRA is a relevant and appropriate requirement for post-closure monitoring.

The requirement for a cap with 2 feet of 1×10^{-6} cm/sec or lower hydraulic conductivity material or equivalent will be met by all three types of cap. The requirements also include control of upgradient surface water runoff entering the site, diversion of offsite surface water, collection of surface water onsite, and minimum slope criteria. These alternatives, in conjunction with a gas collection and control program (being prepared by the City of Spokane), and a closure plan and cost estimate, satisfy the MFS requirements.

Administrative restrictions placed on the site would not satisfy the MFS requirements for landfill closure which requires other specific actions. The No Action alternative does not satisfy the MFS requirements for landfills.

The offsite disposal of any wastes will have to meet all substantive and procedural requirements of federal, state, and local regulations. In addition to disposal requirements, this alternative would also have to satisfy transportation and handling requirements.

Aquifer Unit

Solvents collected from the treatment of the extracted groundwater in any tanks, surface impoundments, or treatment residue would have to meet applicable hazardous or dangerous waste requirements (WAC 173-303) for disposal based on the VOC content.

The groundwater monitoring alternative for the purpose of early detection of contaminant migration in the groundwater does not satisfy ARARs because groundwater contaminant levels would continue to exceed drinking water MCLs for an extended period of time. The same is true for the administrative restrictions, alternate water supply, and no action alternatives.

The groundwater extraction and treatment system for both total plume capture and partial plume capture have to meet similar laws and regulations. The discharge of the treated groundwater has to meet the requirements of the AWQC or MCLs. As the discharge is offsite, NPDES permit requirements for the point source discharge would have to be met before discharging to the Spokane River. The discharge would also have to be analyzed for its effects on fish, wildlife, and habitat in and around the river as required by the Fish and Wildlife Coordination Act.

Primary Balancing Criteria

Once an alternative satisfies the threshold criteria, five primary balancing criteria are used to evaluate other aspects of the potential remedies. Each alternative is evaluated by each of the balancing criteria. One alternative will not necessarily receive the highest evaluation for every balancing criterion. The balancing criteria evaluation will be used in refining the selection of candidate alternatives for the site. The five primary balancing criteria are: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

3. Long-Term Effectiveness and Permanence

This is the ability of a remedial alternative to provide protection and reduce risks to health or the environment long after the cleanup goals have been met.

Landfill Units

The excavation and disposal alternative is only feasible for the Skimmings Unit, a small area within the landfill. Removal to an offsite treatment and disposal facility is the most effective long-term remedy because it removes all of the contamination from the unit, although it does transfer the risks from this material to the disposal facility. Excavation and onsite treatment is nearly as permanent because it can reduce toxicity of the waste. Both of these alternatives remove the contamination from the site or treat it to reduce the toxicity. Once the soils are treated to the cleanup goals there would be no need for long-term maintenance.

Capping the landfill units is the next most effective and permanent remedial alternative. Three variations of cap design were evaluated and all three designs meet the minimum requirements for a landfill cap. Stormwater collection and diversion systems and runoff controls are included in the cap design; all providing a physical barrier that will reduce infiltration to the refuse.

The projected life span of the cap is 30 years or more. Maintenance is required to maintain the integrity of the cap and stormwater diversion systems.

Although capping is containment and not treatment, it reduces infiltration through the refuse thereby reducing the amount of leachate produced. This reduces the amount of contaminants entering the groundwater aquifer.

Implementation of administrative restrictions could not be considered permanent because it can only restrict human access to contaminated groundwater and cannot prohibit it entirely. Their long-term effectiveness depends on successful enforcement.

The no action alternative does not provide any long-term protection of public health or the environment. Contaminants would continue to leach into the aquifer; if the source strength does not remain constant, the contamination plume could expand.

Aquifer Unit

The total plume capture option is a pump and treat system designed to capture the entire contaminated plume as it leaves the landfill area by use of extraction wells. The system would be designed to significantly reduce the contaminants in the aquifer at the landfill boundary. By reducing the source of the contaminants to the offsite plume the contaminated groundwater would naturally attenuate to drinking water levels. The treatment of the contaminated water can be handled by different technologies. The treatment system can be very effective in reducing the contaminant levels in the discharge to background levels, drinking water levels or ambient water quality levels. Each treatment alternative provides a degree of treatment but only with proper operation and maintenance of the system. Pump and treat systems described in the FS have a design life of 20 years.

The partial plume capture pump and treat alternative provides a system similar to the full system but is designed to extract only the most heavily contaminated portion of the plume. This system would allow contamination less than the drinking water standard to continue to pass offsite. The aquifer would take longer to attenuate and the cleanup level would be the drinking water criteria. Discharges to the river from the treatment unit would be designed to meet the discharge ARARs for the Spokane River, similar to the total capture system. This system would also have a 20 years design life.

The alternative water supply system provides immediate protection for human health. However, alternate water does not permantly reduce the contamination in or entering the aquifer. The water system would require normal maintenance.

Administrative restriction can be put in place to prevent the drilling of new drinking water wells in or near the contaminated plume. This would reduce the potential for consumption of contaminated water but would not permantly reduce the contaminant levels or migration of the pollutants.

4. Reduction of Toxicity, Mobility, or Volume

This criteria is an evaluation of the effectiveness of the treatment technologies that passed the screening step. Several technologies are applicable to the skimmings area part of the landfill and others are evaluated for the aquifer unit.

Landfill Units

The excavation and offsite disposal of the skimmings would eliminate approximately 23,500 cubic yards of source material. This reduction is calculated to represent about 10 percent of the PERC loading to the aquifer. Excavation and onsite land treatment or onsite incineration are both technologies that can also be applied to the skimmings. Both would reduce the PERC to near detection limits in the excavated waste. But like the offsite disposal option, any contaminants in the soil beneath the area would continue to migrate.

Capping the landfill units is source control because it significantly reduces the amount of water that passes through the waste units. Water passing through refuse generates the leachate that moves the contaminants into the underlying aquifer. However, capping is not considered a treatment technology.

Neither administrative restrictions nor the no action alternative would treat the contamination; toxicity, mobility, and volume of the contamination would be unaffected.

Aquifer Unit

Extraction of contaminated groundwater (pumping) and subsequent treatment options would reduce the concentration of contaminants migrating downgradient of the extraction wells. The reduction of the concentration of contaminants effectively reduces the toxicity and volume of contaminants in the groundwater. The mobility of the contaminants is controlled upgradient of the well by the zone of influence created by the pumping drawdown action.

The effect on the plume by the total plume capture or the partial plume capture alternative would be similar. It would take longer under the partial plume alternative to achieve the same results.

None of the remaining alternatives--monitoring, administrative restrictions, alternative water supply, or no action--would reduce toxicity, mobility or volume of the contaminants in the aquifer.

5. Short-Term Effectiveness

The short-term effectiveness of each alternative addressed impacts during the time of implementation. This period normally lasts from one to five years and includes construction, start up and operation until the cleanup goals are reached.

Landfill Units

The short term effects from capping the landfill would immediately reduce the risk of contact with contaminated soils or wastes and would reduce the escape of VOCs. There could be some risk to workers' health during construction of the cap.

Excavation of the skimmings with onsite land treatment or incineration would not be effective in the short term, as there would be risks to workers from construction and from the operation of the treatment systems themselves.

Institutional controls would not protect human health, as people may continue to use existing wells in the area of contamination. The no action alternative would have the same result.

Aquifer Unit

Under the treatment alternative, groundwater would be pumped and treated and discharged to the Spokane River. This alternative would in effect control the offsite migration of contaminants past the landfill boundary. It would not, however, pull existing downgradient contamination back to the landfill.

The water discharged to the Spokane River can be treated to meet applicable offsite requirements. The short-term impacts of this alternative is construction. Workers need adequate protection from the volatile organics during well construction and operation of any treatment process that will release VOCs. There should not be any short-term impacts to the community other than construction.

The alternative water supply limits consumption of contaminated groundwater but does not reduce contamination. Since the municipal alternative water supply system is already in place, no new construction should be required, therefore, no short-term effects to health or the environment.

Institutional controls would restrict the use of groundwater but would not improve the groundwater quality. No construction would be required. No action provides no short-term protection to health or the environment.

6. Implementability

The implementability of a remedial alternative considers the technical and administrative feasibility of actually constructing the alternative to make it work.

Landfill Units

No action has, as expected, the highest level of implementability. There is no construction required and no time consideration, but this alternative does not meet ARARs.

Institutional controls or administrative restrictions would be nearly as easy to implement since they do not involve construction. Some of the

restrictions need not be put into effect until the landfill is closed; others can be done earlier. The time required to implement the restrictions depends on the length of time required to prepare and pass local ordinances, file deed notations, or take other administrative actions. However, administrative restrictions by themselves do not meet ARARs.

All the landfill cap options use proven technology and would therefore be the most implementable; construction time is estimated at 8 months to 1 year. Certain site conditions--steep grades in some areas, variable weather--might have an impact on construction (some areas would probably require regrading). To cap the refuse unit, the landfill can no longer be receiving wastes. Capping the other units may occur sooner because they are no longer receiving refuse. Capping would use conventional construction equipment.

Of the skimmings excavation alternatives, offsite disposal would be the simplest to implement. Conventional excavation equipment could be used for the skimmings area, though special containers or transportation methods might be necessary for the actual removal. Onsite incineration would be the next easiest to implement, though material handling and mobilizing and incinerator might present problems. Onsite land treatment would require finding a suitable site (possibly the skimmings unit area), and tests to determine the volatilization/treatment rate. The tests usually require about 3 years of treatability studies. Full-scale implementation might take 5-10 years, in addition to the 3-year land treatment demonstration which also reduces its implementability.

Aquifer Unit

There are no implementation requirements for the no action alternative.

Institutional controls and restrictions, and alternative water could take a year to coordinate among the different agencies. There are no known limitations and no construction requirements identified for these actions. A permanent alternative water supply is already in place, and only limited construction to new homes and normal maintenance will be required in the future.

The groundwater monitoring alternative could utilize the existing monitoring well system supplemented with new wells as needed. There are no known construction or permit limitations for this alternative. A monitoring program is ongoing so there would be no time lag in implementing it.

Aquifer conditions at the site are technically feasible for a pump and treat system. Construction of extraction wells is possible with treatment and finally discharge to the Spokane River. All pump and treat options must meet groundwater withdrawal, treatment plant emission, and point source discharge requirements. There are no major problems anticipated which would affect implementation of any treatment alternatives. Construction of the pump and treatment system will take about two years.

7. Project Costs

Present worth costs are used to evaluate and compare the cost of each alternative. Present worth consists of the sum of the initial capital costs and the discounted annual operation and maintenance (O&M) costs. Table 7 gives a summary of costs for each of the units as detailed in the Feasibility Study.

Landfill Units

The no action alternative would cost nothing and therefore be the least expensive. Administrative restrictions have no present worth costs since the costs are administrative such as passing ordinances.

Costs for capping depend on the type of cap chosen. The costs for the landfill units are estimated in Table 7. For the refuse unit (the largest and most costly one) a membrane and clay cap would cost an estimated $29 million, while a membrane or soil/bentonite cap would cost $22 million.

The costs for excavation alternatives for the skimmings unit are about $2 million for onsite land treatment, $12 million for offsite disposal, and $22 million for onsite incineration. In comparison, the cost of capping the skimmings unit would be $530,000-$720,000.

Aquifer Unit

The no action alternative for this unit would have no construction costs. Institutional controls similar to those for the landfill units would have only administrative costs.

An alternative water supply, which already exists, has an estimated cost of $200,000. The estimated costs for the aquifer alternatives are presented in Table 7.

Groundwater monitoring costs are estimated as $320,000 for a 30 year period.

Collection and treatment costs range from $3.6 million to $87 million, depending on the level of treatment and whether plume capture is partial or total. Partial plume capture is as protective to human health and the environment and is cheaper to implement than the total capture system.

Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state and community acceptance. For both of these elements, the factors considered in the evaluation are the elements of the alternative which are supported, the elements of the alternative which are not supported, and the elements of the alternative that have strong opposition.

8. State Acceptance

Washington State Department of Ecology (Ecology) has been closely involved with the development and review of the Remedial Investigation and

TABLE 7
OLD BURN AND SEWAGE SLUDGE UNITS COST SUMMARY

	Old Burn Unit					Sewage Sludge Unit				
	B1A Membrane and Clay Cap	B1B Soil and Bentonite Cap	B1C Membrane Cap	B2 Land Use Restrictions	B3 No Action	U1A Membrane and Clay Cap	U1B Soil and Bentonite Cap	U1C Membrane Cap	U2 Land Use Restrictions	U3 No Action
Engineering and Design	720,000	520,000	510,000	--	--	140,000	110,000	110,000	--	--
Construction	7,200,000	5,200,000	5,100,000	--	--	1,400,000	1,100,000	1,100,000	--	--
Permitting and Legal	360,000	260,000	260,000	--	--	70,000	56,000	57,000	--	--
Services During Construction	580,000	420,000	410,000	--	--	110,000	90,000	91,000	--	--
Initial Cost Subtotal	8,900,000	6,400,000	6,300,000	--	--	1,700,000	1,400,000	1,400,000	--	--
Annual O&M	15,000	15,000	15,000	--	--	3,000	3,000	3,000	--	--
PW of O&M	140,000	140,000	140,000	--	--	28,000[a]	28,000[a]	28,000[a]	--	--
Project PW	9,000,000	6,500,000	6,400,000	--	--	1,600,000	1,400,000	1,400,000	--	--

[a] Present worth based on 30 years at 10 percent net discount.

TABLE 7 (cont'd)
REFUSE AND SKIMMINGS UNITS COST SUMMARY

	Refuse Unit					Skimmings Unit							
	R1A Membrane and Clay Cap	R1B Soil and Bentonite Cap	R1C Membrane Cap	R2 Land Use Restrictions	R3 No Action	S1A Offsite RCRA Landfill	S1B Onsite Treatment	S1C Onsite Incineration	S2A Membrane and Clay Cap	S2B Soil and Bentonite Cap	S2C Membrane Cap	S3 Land Use Restrictions	S4 No Action
Engineering and Design	2,300,000	1,700,000	1,700,000	--	--	980,000	200,000	970,000	58,000	42,000	42,000	--	--
Construction	23,000,000	17,000,000	16,700,000	--	--	9,800,000	1,500,000	19,000,000	580,000	420,000	420,000	--	--
Permitting and Legal	1,200,000	850,000	840,000	--	--	490,000	74,000	1,400,000	29,000	21,000	21,000	--	--
Services During Construction	1,800,000	1,400,000	1,300,000	--	--	780,000	120,000	970,000	46,000	34,000	33,000	--	--
Initial Cost Subtotal	28,000,000	21,000,000	21,000,000	--	--	12,000,000	1,900,000	22,000,000	710,000	520,000	520,000	--	--
Annual O&M	110,000	110,000	110,000	--	--	--	26,000	0	1,000	1,000	1,000	--	--
PW of O&M	1,000,000	1,000,000	1,000,000	--	--	0[a]	160,000[b]	0[a]	9,000[a]	9,000[a]	9,000[a]	--	--
Project PW	29,000,000	22,000,000	22,000,000	--	--	12,000,000	2,000,000	22,000,000	720,000	530,000	530,000	--	--

[a] Present worth based on 30 years at 10 percent net discount.

[b] Present worth based on 10 years at 10 percent net discount.

Note: Refuse unit cap costs are based on 115 acres and do not include allowances for methane gas control.

TABLE 7 (cont'd)
AQUIFER UNIT COST SUMMARY

	A1A Discharge to Spokane POTW	A1B1 Minimum Treatment	A1B2 Treatment to Drinking Water Stds.	A1B3 Treatment to Non-degradation	A2A Discharge to Spokane POTW	A2B1 Minimum Treatment	A2B2 Treatment to Drinking Water Stds.	A2B3 Treatment to Non-degradation	A3 Groundwater Monitoring	A4 Alternative Water Supply	A5 No Action
Engineering and Design	NF	500,000	570,000	2,300,000	49,000	230,000	270,000	740,000	--	--	--
Construction		4,200,000	4,800,000	46,000,000	250,000	2,000,000	2,300,000	15,000,000	--	--	--
Permitting and Legal		210,000	240,000	920,000	12,000	98,000	110,000	300,000	--	--	--
Services During Construction		170,000	190,000	3,700,000	20,000	78,000	91,000	1,200,000	--	--	--
Initial Cost Subtotal		5,100,000	5,800,000	53,000,000	330,000	2,400,000	2,800,000	17,000,000	--	--	--
Annual O&M		200,000	220,000	4,000,000	420,000	140,000	160,000	1,300,000	34,000	--	--
PW of O&M		1,700,000[a]	1,800,000[a]	34,000,000[a]	3,600,000[a]	1,200,000[a]	1,300,000[a]	11,000,000[a]	320,000[b]	--	--
Project PW		6,800,000	7,600,000	87,000,000	3,900,000	3,600,000	4,100,000	28,000,000	320,000	200,000[b]	--

NF indicates alternative not feasible.

[a] Present worth based on 20 years at 10 percent net discount.

[b] Present worth based on 30 years at 10 percent net discount.

Note: The estimated project PW total for alternate A4 was provided by the client.

Feasibility Study processes. Ecology commented on the RI/FS and worked with EPA on the proposed plan. The comments from the state were an important factor in EPA's decision to recommend an alternative that differed from the recommendation in the Feasibility Study. The state strongly favors pump and treatment of the contaminated groundwater plume as an interim measure until contamination coming from the landfill is reduced to acceptable levels. Although EPA has been working closely with Ecology to ensure that this ROD includes the state's comments, EPA, has not yet received the state's concurrence letter.

9. Community Acceptance

The results of the public comment period and the discussion during the RI/FS public meeting indicate that the residents who live near or have been affected by contamination from the Northside Landfill support the proposed plan with its interim pump and treatment system. The community desires a remedy which would begin treating the contamination as soon as possible. The City of Spokane (the PRP) recommended that pump and treat only be implemented if contaminant levels in the plume were not lowered by the other closure actions, specifically the cap. The community recognizes that none of the alternatives, except for the pump and treatment system, will be implementable until the landfill closes. The pump and treatment system provides a protection mechanism which is not contingent on landfill closure.

The differences between the city's and EPA's recommended remedial actions were highlighted in the proposed plan fact sheet and at the public meeting. The resident community supported the EPA interim pump and treatment system because it actually reduces the contamination in the aquifer, rather than relying solely on natural attenuation. It was estimated that it would take between five to ten years after the cap was in place before the natural attenuation process would be noticed in the aquifer. The pump and treat system can be implemented in about 2 years.

Closure of the landfill with a cap, periodic monitoring, and other state landfill closure actions were considered by all parties to be necessary parts of the remedial action. Individual concerns about cost and institutional controls (administrative requirements) were responded to in the attached Responsiveness Summary.

THE SELECTED REMEDY

Description

The selected remedy for the Northside Landfill Superfund site consists of the following elements:

- Closing the landfill
- Capping the landfill waste units
- Pumping and treatment of groundwater
- Monitoring the groundwater
- Providing alternative water
- Enacting administrative restrictions
- Controlling landfill gas emissions

Closing the Landfill

As soon as possible, the landfill shall be closed to stop the flow of incoming refuse. The only disposal area currently in use has been designated as the Refuse Unit.

An alternative disposal facility has been planned by the city as part of a regional waste-to-energy project. The schedule for the new incinerator facility is for operation to begin in late 1991. The start up of the new waste-to-energy facility will allow Northside Landfill to be closed.

In the event that the new disposal facility is not available by January 1, 1992, all incoming refuse to Northside after that date will be required to be disposed in new landfill units that meet the State Minimum Functional Standards (MFS) for operating landfills. The MFS requirements include lined units with leachate controls. The new units would allow closure of all the old units.

Capping the Landfill

The landfill must be capped as soon as practicable. A draft closure plan, evaluating the phased closure of all landfill units and including a conceptual design for the cap, will be developed consistent with ARARs. If phased capping is feasible, the closure plan will include a schedule for the phased implementation. Construction of the cap must start consistent with state MFS deadlines.

All of the cap designs in the feasibility study meet the MFS requirements. The cap functions to contain the refuse units and to provide a barrier to reduce infiltration into the wastes, thereby reducing groundwater contaminant loadings. The feasibility study suggests this is the most important remedial action for the long-term control of groundwater contaminants from the landfill.

Although capping is a general requirement for the landfill, certain waste units may not be contributing to the contamination problems. If adequate data can be obtained to demonstrate that an area is not contributing to any of the existing problem conditions, a variance (waiver) for the capping requirement may be obtained for that particular unit. At the Northside Landfill, the capping variance may apply to an area designated as the Old Burn Unit.

The Old Burn Unit was the original area of the landfill which allowed open burning. This area was closed in about 1960 and contains refuse that has been partially burned. Therefore, the waste in this unit may be characteristically different from any of the other waste units. Additional study will have to demonstrate that contaminants of concern are not migrating from this waste unit before the city applies for a capping variance for this area.

Pumping and Treatment of Groundwater

The construction of an interim extraction well system (pumping) and a subsequent treatment facility for the extracted groundwater is necessary to begin controls on the release of contaminants beyond the landfill boundary. Contaminated groundwater is the major route of exposure for human health and the environment. The installation of a pumping and treatment system is designed to serve these functions:

1. Establish a system which will control the migration of contaminants downgradient from the landfill. The system must effectively control the concentration for the contaminants of concern so that the groundwater downgradient from the point of compliance meets ARARs; e.g., the Maximum Contaminant Levels (MCLs) of the Safe Drinking Water Act. The point of compliance is the landfill property boundary with performance monitoring to be located downgradient but beyond the zone of influence of the extraction wells.

2. Treatment of the extracted groundwater. The treatment facility for the extracted contaminated groundwater will have to reduce the levels of all contaminants to required levels prior to discharge to the Spokane River. If the discharge from this facility is through the sewage treatment plant, the pretreatment requirements will also have to be met. The river discharge is considered offsite and, therefore, must meet all federal, state, and local requirements such as obtaining an NPDES permit.

   Any air emissions from the treatment facility will have to meet emission requirements. Design of the treatment facility will also need to consider published risk assessments for VOC releases.

The pumping and treatment system is considered an interim measure to control contamination migrating from the landfill until such time as other remedial actions, principally the cap, have demonstrated their effectiveness at reducing the groundwater contamination. The pumping and treatment can be discontinued when one year of groundwater monitoring indicates that groundwater does not exceed the MCLs at the point of compliance for the contaminants of concern, without running the pump and treat system. The pumping and treatment system cannot be dismantled for an additional five years after monitoring indicates it can be discontinued.

The contaminated groundwater plume that is downgradient from the landfill boundary will not be extracted and treated and will be mitigated through natural attenuation (flushing action).

The EPA review of the FS report recommended that an interim pumping and treatment system be designed and constructed so that the groundwater meets

standards at the point of compliance. The decision to include pump and treat as a remedial action is an addition to the recommendation in the city prepared Feasibility Study. The rationale used to arrive at this recommendation is summarized below:

1. The landfill cap cannot be completed until 1992 after the existing refuse units are closed.

2. The effectiveness of the cap in reducing the contaminant loadings to the aquifer has a lag time from 5 to 10 years (FS estimate) before the aquifer will show lower levels of contaminants.

3. Once the cap is effective in reducing the contaminant loadings (5-10 years), it will take additional time for the contaminant levels to fall below the drinking water MCL levels.

4. The citizens supported the EPA recommended pumping and treatment system because it will get the cleanup started and not further delay aquifer protection.

5. The installation of the pumping and treatment system will start groundwater remediation which could otherwise be delayed if closure and capping schedules slip due to delays in the startup of the waste-to-energy disposal facility.

6. The active system will also allow time for further definitive studies on the Old Burn Unit, which may not be contributing to to the groundwater contamination problems and could therefore receive an MFS variance. A change in the closure requirements for this area could result in a cost savings for capping.

The pumping and treatment system described above is similar to the feasibility study alternative identified as partial plume capture. The partial plume capture pump and treat system was not recommended by the city.

EPA's conclusion is that the interim pumping and treatment system could provide positive remedial action on a faster schedule, with more control, meet the needs for treatment where practical, and be more protective of human health and the environment without disproportionately higher costs. As soon as other remedial measures, specifically the cap, become effective in consistently lowering the contaminant levels to below MCLs at the point of compliance, then the pumping system can be evaluated for shutdown.

Monitoring the Groundwater

A groundwater monitoring plan for long-term monitoring of the aquifer, domestic water supply wells, contaminant plume, and performance of the extraction well system must be submitted for approval as a part of the remedial design. Until the long-term monitoring plan is approved by EPA, the City of Spokane is currently conducting quarterly monitoring of the existing monitoring wells and the 11 established domestic residential wells. The long-term monitoring program may require construction of new monitoring wells.

Providing Alternative Water

The City of Spokane has continued to provide a source of potable water to those residences whose domestic wells have been contaminated or become contaminated above drinking water standards by the Northside Landfill. The alternative water source must continue until the aquifer contamination is reduced to the cleanup levels.

Any private wells currently in use that are adversely impacted by any of the remedial actions may be eligible for supplemental alternative water. The pump and treat system may alter the usefulness of several wells, requiring their replacement or alternative supplies. The city is currently providing alternative water by extending the municipal water supply system. This system is currently meeting the requirements for potable, domestic use water.

Enacting Administrative Restrictions

Administrative restrictions or institutional controls need to be enacted which will protect the landfill cap, monitoring wells, and the pumping and treatment system. Restrictions should be placed on the construction of new wells and the use of existing wells in the contaminated plume. These actions must be part of the planning for implementation of the remedial action.

Controlling Landfill Gas Emissions

The gas emissions from the landfill have to be actively controlled to prevent offsite migration according to MFS requirements. This action must be integrated into the closure plan and capping actions.

STATUTORY DETERMINATIONS

The selected remedy meets statutory requirements of Section 121 of CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. The evaluation criteria are discussed below:

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by reducing the amount of contamination in the groundwater, reducing the exposure routes by capping the landfill, and providing alternative water. The major exposure route is ingestion of contaminated groundwater, with several minor secondary routes through air and direct contact.

The remedy reduces the exposure to contaminated groundwater during both the short term and the long term. Short-term controls include:

1. Alternative water supplies to those with contaminated wells;

2. Construction of a pumping and treatment system to reduce contamination levels to drinking water standards and control offsite migration; and

3. Placing a cap over the refuse units.

Short-term exposure will be reduced by preventing direct contact and uncontrolled air emissions. Long-term control is provided by the cap, which reduces the leachate loading into the aquifer by controlling the source. Administrative restrictions will be effective in keeping the long-term exposure low by protecting the cap and monitoring wells system and controlling use of wells in the contaminated portions of the aquifer, until the aquifer remediation is complete.

The pumping and treatment system will be designed to reduce the toxicity, and volume of the contaminants in the groundwater. Nearby residents affected by contaminated groundwater, or by the action of the pumping and treatment system, will receive alternative water supplies. The City of Spokane has extended its municipal water system into the area and is supplying potable water to those residences which have contamination in excess of MCLs in their wells.

No exposure problems are expected during construction of any of the remedial actions. Workers and residences can be protected by compliance with adequate health and safety plans and health and safety monitoring. None of the activities proposed involves direct contact with acute hazards.

Attainment of ARARs

The selected remedial action also meets all applicable or relevant and appropriate requirements (ARARs) that have been identified. No waiver of any ARAR is being invoked for the selected remedy. The major ARARs are briefly described below.

The laws and regulations of concern include but are not limited to the following:

1. Resource Conservation and Recovery Act (RCRA; 42 U.S.C. §6901), RCRA regulations (40 CFR 261-280), Washington State Dangerous Waste Regulations (WAC 173-303 and 70.105 RCW), and Washington State Minimal Functional Standards for Solid Waste Handling (WAC 173-304 and 70.95 RCW).

   Landfill closure requirements of RCRA and Washington State Dangerous Waste Regulations will be attained by installation of the landfill cap to minimize leachate production, and operation of the groundwater extraction wells to remove contaminated groundwater. The selected remedy prevents further spread of groundwater contamination. Closure of the Northside Landfill to State Minimum Functional Standards will be evaluated to ensure consistency with RCRA landfill closure standards.

   The technology applicable for the landfill must meet the Washington state standards for ongoing landfill operations, closure, capping, leachate containment, and methane control. A variance for disposal in a lined unit with leachate treatment is scheduled to be issued, allowing disposal in the existing refuse unit until December 31, 1991. Other substantive MFS requirements must still be met.

2. Rules and Regulations of the State Board of Health Regarding Public Water Systems (WAC 248-54).

   The alternative drinking water supply currently in use is a municipal system which is in conformance with these regulations.

3. Model Toxics Control Act (Initiative 97).

   This is the state's operative hazardous waste cleanup law. Regulations under this law are pending promulgation.

4. Safe Drinking Water Act (42 USC 300), and Primary Drinking Water Standards (40 CFR 141).

   Groundwater will meet MCLs, the appropriate health-based standards, as the contaminated plume is extracted and leachate generation is minimized. The selected remedy will prevent exposing the public to contaminated drinking water by monitoring residential wells and connecting an alternative supply when conditions require it. Therefore, by monitoring, providing an alternate drinking water supply, and restricting groundwater use, until the aquifer no longer exceeds drinking water levels in the area, the selected remedy will meet the requirements of these regulations.

5. Clean Air Act (72 USC 7401).

   If an airstripping system is used, concentrations of contaminants in the airstripper emissions will be required to meet the requirements of the Clean Air Act. Flares for the methane gas extraction system must also meet the requirements of the Clean Air Act.

6. Clean Water Act (33 USC 1251).

The selected remedy treats the extracted water to meet MCLs, health-based standards, or Water Quality Criteria prior to discharge, whichever is lower. Therefore, there will be no adverse impact on surface waters resulting from discharge of treated groundwater, and requirements of these regulations will be attained.

Offsite Regulations

There are actions which will occur offsite which require compliance with all laws and regulations. Such actions include storm drainage and discharge of treated water to the Spokane River. These discharges will be subject to the National Pollution Discharge Elimination System (NPDES) effluent limits, pursuant to NPDES (40 CFR 122), NPDES Permit Program (WAC 173-220), and Water Pollution Control Act (RCW 90-48), as a minimum..

Cost Effectiveness

The cost effectiveness of each remedial alternative was evaluated. Closing and capping the landfill according to the State ARAR (Minimum Functional Standards) represents the most expensive part of the selected remedial action, approximately $30 million. However, this remedy also represents the least expensive way to provide long-term source control. The excavation and disposal and/or treatment of certain landfill waste units did not represent a significant cost benefit over capping.

The construction of a partial plume extraction and treatment system for mitigation of groundwater contamination is the best technical solution for treating contaminants in the groundwater for these specific site conditions. The partial plume system is as equally protective as the total plume capture systems at substantially lower cost.

The specific cap material and the groundwater treatment system are not specified to allow for analysis during the design phase. The costs of the pumping and treatment system may vary greatly depending on how the system is designed to meet the performance criteria.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Alternative treatment technologies were generally considered unfeasible for the refuse area of the landfill, because of the size of the source (345 acres containing over 5 million cubic yards of waste materials). Many of the other alternative technologies are not yet proven for municipal landfill leachate and were estimated to be more expensive for the same level of treatment achieved by less costly alternatives.

Permanent treatment, along with alternative or resource recovery technologies, was included in the initial screening of remedial action technologies. Several treatment technologies passed the initial screening for the Skimmings Unit (a small part of the landfill). Based on the cost effectiveness analysis, these treatment technologies were not selected. The costs for alternative treatment technologies for the skimmings area were considered disproportionately high compared to the cap, which was determined to be protective of human health and the environment.

Treatment was selected to mitigate the groundwater contamination problems. Treatment of the extracted water will be designed to reduce the contaminant loading and prevent their re-entry into either the groundwater or into the surface water discharge. The final treatment technology has not been specified but will be selected from those conceptually identified in the FS during the design phase based on performance criteria.

Land Disposal Restrictions

The selected remedy does not require placement of RCRA hazardous wastes either on or offsite. Therefore, the Land Disposal Restrictions do not apply.

Preference for Treatment as a Principal Element

Treatment is the selected remedy to mitigate the aquifer contamination. Ingestion of the contaminated water is considered the primary route of human exposure.

Treatment technologies were evaluated for the landfill source but were not selected. Several factors make treatment unfeasible or too expensive for the landfill units:

1. The size and volume of the landfill wastes would make excavation and treatment difficult, expensive, and possibly hazardous to workers onsite.

2. Alternative treatment technologies for effective onsite treatment of landfill wastes are still experimental for the contaminants of concern. The costs were significantly and disproportionately higher for the reduction in risk.

CONCLUSION

An extensive evaluation of the Northside Landfill site has resulted in the identification of the problem (chlorinated organic, industrial solvents) and proposed solutions. The exposure to the community has been controlled in the interim with the installation of the municipal water supply. The costs of the remedial actions are mostly for the closure and capping of the landfill which are required under state law.

The selected remedy is expected to control the migration of contaminants offsite, to reduce the contaminant loading rate to the environment, and to protect public health and the environment. The result of the remedial actions will be to return the contaminated part of the aquifer back to its availability as a drinking water supply, to safely contain the material disposed of at the Northside Landfill, and fully comply with ARARs.

APPENDICES

RECORD OF DECISION
NORTHSIDE LANDFILL
SPOKANE, WASHINGTON

Appendix A: Responsiveness Summary

Appendix B: Administrative Record Index

NORTHSIDE LANDFILL RESPONSIVENESS SUMMARY

Overview

Northside (North) Landfill is an operating municipal solid waste facility in Spokane, Washington. The site is located on a 345 acre parcel between Nine Mile Road and the bluff of Five Mile Prairie.

In 1981, the City of Spokane began an investigation which identified contaminated groundwater migrating off site and contaminated drinking water wells in the area. In 1983, Spokane extended city water to those homes with contaminated wells and later to the entire area northwest of the landfill.

In October 1984, the Northside Landfill was added to the National Priorities List (NPL) because of contamination of groundwater. The NPL is a list of hazardous waste sites across the nation designated for study, and if necessary, cleanup under the Federal Superfund Program.

As owner and operator of the landfill, the City of Spokane was identified as a potentially responsible party (PRP) and considered liable for investigation and cleanup costs. In 1986 Spokane began work on the Remedial Investigation/Feasibility Study (RI/FS) which is a comprehensive study of site conditions, hazards, possible exposure pathways, and cleanup alternatives. Initially, the Washington Department of Ecology (Ecology) was responsible for overseeing the work at this site.

In order to identify community concerns about the site, community interviews were conducted in August 1987. Based on those interviews, a Community Relations Plan was developed which was published in November 1987.

On March 16, 1988, the U.S. Environmental Protection Agency (EPA) and Spokane signed an agreement called a Consent Order to complete the RI/FS and oversight of the work returned to EPA. Shortly after that the Community Relations Plan was was revised by EPA to reflect new information. The final RI/FS report was made available for public review in March 1989.

EPA's preferred alternative,which was presented in the proposed plan fact sheet, dated February 28, 1989, is different from the recommended plan in the Feasibility Study prepared by Spokane. The difference is that EPA's preferred alternative calls for installation of a treatment system which pumps and treats contaminated groundwater as part of the initial remedy, whereas Spokane preferred additional monitoring prior to installing a pump and treat system.

This document includes a summary of comments and concerns raised during the comment period held from March 1 to March 31, 1989, and a brief description of community background and involvement.

The comments received from citizens generally support EPA's preferred alternative. Some concerns were expressed about how the construction of the pump and treat system will affect the community, the cost of the system, and the health risks. Spokane and other local officials expressed their belief that immediate pump and treat will not be a cost-effective use of public funds.

Background on Community Involvement and Concerns

The community living next to the landfill has been active since 1976 and in 1981 formed the Pinemeadows Homeowners Association to work on closing the Northside Landfill.

The community interviews conducted by EPA in 1987, revealed the following community concerns about the Northside Landfill:

- Citizens are concerned that the aquifer will never be cleaned up.
- Citizens were also concerned about the operation of the landfill; problems included illegal dumping, odors, failure of the buffer zone, and landfill height.
- Homeowners who received alternative water supplies from the city expressed concern that the costs will increase making it unaffordable to irrigate their property.
- Citizens were also concerned that the landfill cleanup may have adverse economic impacts on their property values. They were also concerned that garbage rates will increase.

Summary of Comments Received

Comments and questions raised during the Northside Landfill public comment period on the proposed plan are summarized below and are grouped by category. EPA received 23 letters from the public during the comment period.

As part of comment period, a public meeting was held on March 15, 1989, at the Spokane City Council Chambers. About 50 people attended this meeting and 10 people gave public comment. The meeting consisted of a presentation by EPA, and CH_2M Hill (Spokane's contractors), followed by a question and answer period.

Questions included the timing for installing the pump and treatment system, the cost, the cap, and health concerns. Copies of the transcript are available at the Spokane Public Library, Downtown Branch, and the City of Spokane Engineering Services Library in the Municipal Building.

RESPONSIVENESS SUMMARY

Preferred Alternative

The following reflects the citizens' or agencies' comments which support EPA's preferred alternative for cleanup of Northside Landfill. In addition, eight citizens wrote letters of support with no comments or concerns expressed.

1. **The Washington Department of Ecology favors immediate pump and treat as one of the first measures at the site as it provides an interim solution to controlling contamination until the cap becomes effective and the landfill is closed.**

Response: Support for the proposed pump and treat option is noted.

2. **One citizen spoke in favor of the preferred plan and urged more stringent administrative restrictions.**

Response: Administrative restrictions or institutional controls are designed to protect public health and the environment and must also protect any remedial action. Restrictions to protect the pump and treat systems will be required. A typical administrative restriction would be to prohibit the use of any private well which would reduce the effectiveness of the barrier wells placed as part of the pump and treat system. Other possible administrative restrictions that will be evaluated are whether the construction of new wells in the contaminated plume, or reuse of wells already in the plume, can be allowed. After the cap is in place, use of the landfill property will need to be restricted to protect the integrity of the cap.

3. **Several citizens wrote to support the proposed alternative but did not want any more disruption to their lives with more pollution, noise or undue construction. The concern was that the pump and treat system be designed and installed where it will have the least impact on the neighboring community.**

Response: The construction plan will not be ready for some time; however, impacts on the community are a part of the plan review. Some noise and disruption during a construction activity is expected, but efforts will be made to reduce its impact on the neighborhood. Long term impacts, such as noise or building location, can be controlled during design and is an element considered in the review and approval process.

4. **A local attorney wrote to express support for pump and treat because of Spokane's repeated failures to comply with environmental regulations.**

Response: The suggested failures of the City of Spokane to comply with environmental regulations is beyond the scope of evaluation for this study. We were not aware of any environmental regulations that Spokane was violating by conducting the study phase of this project.

5. **Another citizen wrote to support the preferred alternative because cost of pump and treat in the future will be even more and would come on the heels of costs associated with the incinerator.**

Response: Costs for construction have typically increased with time. It would be expected that the pump and treat system would cost more if construction is delayed. The money for the closure and remedial actions at Northside will probably come from several sources. Cities generally issue

revenue bonds for major construction projects. Because the incinerator is to replace some landfill operations in the city and county, some of the revenue obtained by selling the incinerator bonds is projected for use on Northside's closure. It is expected that the city will also obtain money from other sources. EPA does not direct responsible parties in their choice of funding mechanisms for Superfund work.

The following comments were written to express disagreement with EPA's preferred alternative for cleanup at Northside Landfill.

1. **City of Spokane doesn't agree with that part of the preferred alternative involving the pump and treat system. They advocate that a five year monitoring period before installing the pump and treat system would be more cost effective. The City of Spokane believes undue secondary impacts will occur if pump and treat system goes into effect. The construction of the towers and pump and treat system will be noisy, and unsightly. Spokane is also concerned that air contamination and surface water contamination will occur because of releases from the stripping towers and discharge from the treatment plant.**

Response: The five year wait before installing any pump and treatment system is based on the assumption that the cap will have an immediate and measurable effect on reducing the amount of contamination reaching the aquifer. If a reduction in the concentration of contamination in the aquifer would not occur within five years (3 years after capping), the pump and treat system under the City's proposal would still need to be installed. By beginning the design and implementation of the pump and treat system now, the system would be operational earlier and may cost less depending on inflation and plume migration.

After the pump and treatment system is in operation, reduction of the contamination in the aquifer leaving the landfill can begin. The pump and treat system can reduce the contaminant loading thereby reducing the size and concentration of the plume off-site.

One of EPA's objectives is to permanently reduce the toxicity, volume, and mobility of the contamination. Groundwater is currently being contaminated by the landfill to levels above the drinking water standards. This is considered an adverse effect on the groundwater and other potential receptors of the groundwater, and is prohibited under state and federal regulations. Capping can reduce mobility, but only treatment will permanently extract the contaminants of concern from this site. A second objective is to restore drinking water aquifers that are affected. The Spokane Valley Rathdrum Prairie Aquifer is a sole source drinking water aquifer. Our evaluation indicates that there is a high probability that the contaminated portion of the aquifer can be restored to meet drinking water standards.

Construction will create some temporary conditions such as: noise and traffic, but proper planning can reduce any long term conditions to acceptable levels. Locations of above ground structures and the treatment plant can be placed in areas that reduce undesirable impacts.

Air contamination will occur if some type of air stripping is used to treat the groundwater without any secondary adsorption system. Other types of treatment are possible. With any treatment system, any releases to the air would have to be below any health based standard set for the contaminants of concern.

Discharges of surface water from a treatment system will have to meet water quality standards for its release. Treatment systems are available to clean up the water to meet health and environmental criteria.

The purpose of pumping and treating the groundwater is to reduce the contamination leaving the landfill area, restoring the usefulness of the aquifer, and permanently reducing the contaminants of concern. The treatment system and its discharge(s) are a part of the overall permanent treatment remedy for the site. All parts of the treatment system will have to meet health based standards.

2. **Another citizen questioned the validity of the cap because natural geologic structures in the area will allow lateral movement of any water, still allowing water into the site. This same citizen suggested we allow the natural forces to flush the contaminants out of the site instead of capping and that the environmental impacts of remedy could be worse than doing nothing. This citizen did suggest however that, if the plume does not respond as he predicted, to begin implementing the pump and treat.**

Response: An evaluation of the lateral migration of water from the Five Mile Prairie entering the landfill was done as part of the agency review of the Feasibility Study. The well logs for the locations on the bluff show quite uniform material down to the first aquitard layer. The clay aquitards were found to be located at a lower elevation than the bottom of the refuse fill. Therefore, any horizontal movement of infiltration would be below the level of the refuse. If the groundwater does not move through the refuse, it will only contribute to the aquifer as flow and would not contribute to additional contaminant loadings to the groundwater.

Natural flushing action would allow contaminants to enter the environment at an unacceptable rate. This action could take decades because of the size of this landfill and the small amount of rainfall which generates the leachate. Leachates would be generated for decades rendering the aquifer in this area unusable. Leachate leaving the landfill totally uncontrolled is contrary to current laws and regulations.

Capping the landfill is considered to be a requirement of the State under the State Minimum Functional Standards for closure of a landfill. The evaluation in the Feasibility Study suggests that capping is the long term solution to control the rate of contaminant release into the aquifer. Currently that rate of contaminant release is above health based concentrations.

Waiting before installing a pump and treat system would only delay the corrective action needed to provide direct controls to restore the aquifer. The Feasibility Study recommended installing the pump and treat system if aquifer conditions didn't improve within five years. If, the effects of the cap did not demonstrate effectiveness during the five year period, a pump and treat system would be required, only adding to the delay in cleaning up the aquifer.

3. **The Spokane County Health District recommends waiting until the cap has been in place five years to determine if contamination was still stable or not growing.**

Response: See previous answer.

4. **Two state representatives wrote to express their concern for spending an additional $4.1 million when health and environmental benefits were negligible.**

Response: The $4.1 million cost estimate for the pump and treat system includes operation and maintenance costs for 20 years. With a pump and treat system in place, the containment of the contamination may actually present a cost savings in the overall cleanup activities. Also, if the cap is as effective as the City represents, the pump and treat system will not need to be operated for as long a period of time.

Health Risks

1. **The City of Spokane states health risks at the site are minimal and the preferred plan cannot be supported on the basis of protection of human health.**

Response: The risk analysis indicates that the health risks are low if organisms are not exposed to the contaminated aquifer. EPA prefers making contaminated water safe to use again, which is protective of human health and the environment. The alternative water supplied by the City protects human receptors but alternative water is considered a temporary measure to protect public health, and does not correct the problem.

2. **The Director of Spokane's Water and Hydroelectric Services wrote to say that "no citizens living within the plume are using that water for household use." therefore, health risks are low and the pump and treat system is unnecessary.**

Response: See previous answer.

3. **A citizen requested more information on long term health effects.**

Response: EPA's risk analysis determined that both long and short term health risks were very low. The Federal Department of Health and Human Services - Agency for Toxic Substances and Disease Registry (ATSDR) also did not recommend any long term health studies based on their Health Assessment of the site. Local, state and federal health agencies can initiate health studies at any time together or independently, but based upon the very low exposure potential for area residents at or near the site, they are not now recommending such a follow up.

4. **A representative of Citizens for a Clean Environment wondered if bonds were being posted to protect the public health and welfare (uncertain if she meant at Northside or in relation to incinerator).**

Response: EPA's Superfund Program is required to work with the PRP to protect the public health and the environment. This normally does not require that special bonds be posted to protect public health. EPA will provide oversight on the remedial action work to ensure that it complies with the laws and approved plans. If conditions change that require a change in the remedial action, this will be immediately evaluated. Both EPA and the City have mechanisms in place to deal with emergencies and/or unanticipated changes in a project.

5. **A citizen supports delaying installation of pump/treat because risk is to low.**

Response: The alternate water system that is in place is for the protection of human health. However, alternate water is not considered a permanent solution to the cause of the problem and it is not the only factor considered. Currently there are no administrative restrictions to prevent a new well from being installed in the contaminated plume or protecting a well already in use from an unexpected plume shift. Using a new well in the plume area would add a level of risk to those using the contaminated water. Also see answers to Question 1 of this section.

Cost

1. **The City of Spokane states that the cost of pump and treat adds undue burden on taxpayers and is an unnecessary cost in conjunction with capping.**

Response: The pump and treat system is a cost for mitigating groundwater pollution problems originating from the Northside Landfill. The costs in the Feasibility Study are estimated costs based on projected remedial actions. The cost of the pump and treat system is a part of the total cost. If the capping actions turn out to be adequately protective of the environment, then the interim pump and treat system can be shut down. If the pump and treat system contains the plume, it may save citizens money in that they could use their wells again instead of purchasing water from the city.

2. **A citizen asked how much of taxpayers money has been spent on the site to date.**

Response: EPA has spent an estimated $120,000 and the City of Spokane's costs are estimated at $1 million. Ecology has also expended costs at this site in excess of $13,000. The city of Spokane has been doing the actual field work, such as installing the monitoring wells. EPA's and Ecology's costs are for oversight of Spokane's work. Money spent by EPA is from the federal Superfund. The money in the Fund comes from taxes on chemical manufacturing industries and federal tax sources.

3. **Another citizen questioned how the closure will affect garbage rates in the city.**

Response: EPA has no way of knowing whether garbage rates will be affected by the landfill closure. Any such decision will have to be made by the city of Spokane.

4. **What will be the actual costs -- are all costs discounted to present costs?**

Response: Final costs cannot be calculated until final design plans are approved. The Feasibility Study includes cost estimates for the various alternatives. These cost estimates are further refined by projecting operation and maintenance costs over the next 20 to 30 years. The projections are estimates for what it will cost as money is required in the future. These projected future costs include interest, inflation, and other economic factors. Rather than use future dollar costs for these estimates, all future costs use today's dollars or present worth. The cost estimate for the preferred plan is approximately $35 million.

5. **The City of Spokane Water and Hydroelectric Services Director wrote to say EPA is requiring City to do expensive cleanup on a "relatively minor" problem.**

Response: Sites which are placed on the National Priorities List (NPL), are known to present some type of threat to public health or the environment and are not considered minor problems by EPA. The state requirement to properly close a landfill, thereby controlling environmental releases applies to Northside and other landfills in the state. The actions necessary to undertake these tasks are required of Spokane whether or not the landfill is a Superfund site. The cost of just the required cap for this closure is estimated to be $25 million and represents about 80% of the cost of the proposed remedial action. The decision to implement a pump and treat system to mitigate a pollution problem and begin to restore a valuable drinking water aquifer is an important aspect of the final site closure and remediation.

Environmental Risks

1. **The City of Spokane does not believe other environmental receptors are exposed or will be exposed in the future, therefore, pump and treat is not necessary because risks don't exist.**

Response: Since the installation of the municipal water supply, no specific environmental receptors have been identified. However, the environmental risks are not the only factors in evaluating a remedial action. (See answer on Page 6, Health Risks, Question 1).

Public Participation

1. A citizen expressed concern that being expected to respond to the Feasibility Study was unreasonable because it was too technical. The commentor requested assistance on this and future projects.

Response: EPA has attempted to keep the community actively involved in the evaluation process through fact sheets and informational meetings because of our concern over the complexity of this study and the Superfund process. In addition, under the Superfund Program, Technical Assistance Grants (TAG) recently became available to groups effected by Superfund sites. For each site on the NPL a TAG of up to $50,000 is available for use by community groups to hire a technical advisor to help them understand the Superfund process and to aid them in commenting on technical documents relating to the site.

An information package on applying for a Technical Assistance Grant is available at the Spokane Public Library, Downtown Branch, as well as the City of Spokane Engineering Services Library in the Municipal Building. You can also contact EPA's Technical Assistance Grants Coordinator, Dwight Davis, in Seattle at (206) 442-0603.

EPA and Ecology have conducted many activities throughout the project in order to keep the community informed. A list of these activities can be found on page 12 of this document.

Landfill Gas

1. A citizen suggested pumping the gas out of the landfill which should take care of the volatile organics that are contaminating the groundwater.

Response: The landfill will generate methane gas for a long time as the biological degradation continues. Controls for the collection and treatment of the methane will provide conduits for the other volatile gasses to escape the landfill. Vapor extraction was considered in the Feasibility Study evaluation and reviews, and it was determined that very little reduction in the pollutant loadings could be accomplished in this manner. Vapor extraction will occur as a passive part of the gas control system and is expected to help control off-site migration. The landfill cap will also be designed to reduce the movement of volatiles into the soils.

Other

1. Will the pump/treat system reduce well yields in areas outside the plume?

Response: The Spokane Valley Rathdrum Prairie Aquifer is a very productive aquifer, therefore, reduction in well yields is not expected. The conceptual design in the Feasibility Study uses pumping rates that probably would not

have any reduced yield effect on any private wells. A few private wells may have pumping restrictions placed on them to prevent their reducing the efficiency of the operation of the pump and treat system, but these wells would have to be located close to the extraction system and currently are not used.

2. **Several citizens have concerns over the water rates and volume of water received since they haven't been able to use their wells, have had to purchase city water, and the volume of provided water has been less than they want. They are concerned that after their contract expires they will have to pay more for city water then it would cost them to use their own wells. They believe the water problem isn't theirs so they shouldn't be penalized. What can be done to help them continue to receive water at a reasonable rate until they can use their wells again.**

Response: A purpose of the remediation effort is to restore the usefulness of the aquifer that has been impacted. If this takes longer than the remaining five years of contracted water, it is up to the city to negotiate another agreement. Alternative water is included in the remedy because some private supplies have been adversely impacted by the groundwater contamination. Pumping is designed to restore the aquifer for all uses. Once restored then homeowners can evaluate the best system for their water supply.

3. **A citizen from Citizens for Clean Air asked: Will the same problems occur at the ash landfill for the incinerator? Also, what is being done to recycle or reprocess items in the waste stream to prevent further pollution? She also asked: How is this affecting property values; Are bonds being posted to cover periodic testing of incinerator for 50 - 75 pollutants? Would a plastic cap really work when gophers abound in the area?**

Response: The design of a new ash landfill will be required to follow state solid waste regulations which have been established to control all environmental impacts. Recycling is an issue beyond the design of corrective actions at the Northside Landfill.

The Feasibility Study did not address the impact on property values since this is not part of the Superfund remedial action. After the remedial actions have been taken, then the county may evaluate property values if there are long term impacts on them.

The Northside Landfill is not a part of the incinerator project. This effort is to close this landfill and use other alternatives for solid waste management. If any ash from the incinerator does get disposed of at Northside Landfill, it will have to be in an area that meets all the new requirements for disposing that kind of waste.

The use of a plastic membrane as part of the landfill cap will have to be designed to withstand the effects of the local environment. Membrane caps have been used effectively in many different situations including areas where burrowing animals live.

4. Another citizen wrote that the proposed incinerator should be moved downwind of Spokane, not upwind as scheduled.

Response: The location of the incinerator is beyond the scope of this project. This comment has been directed to the city/county waste energy office.

5. How long will the cap last?

Response: The cap will be designed as a permanent closure action. For cost projections a 30 year period is utilized. The integrity of the cap will require periodic evaluation and will require annual maintenance. Most projections for remedies do not extend beyond 30 years, but if the design is proper, the cap will remain effective beyond the 30 year design period.

6. A citizen asked, what government body is responsible for making Northside Landfill a Superfund site, and how do the problems at the site compare to a privately owned landfill. She also asked if the problems at Northside were increased by government negligence or inaction.

Response: The U.S. Environmental Protection Agency is the agency responsible for designating Superfund sites and placed the Northside Landfill on the National Priorities List. This designation is applicable to sites whether they are publicly or privately owned.

There are certain kinds of environmental problems associated with landfills regardless of ownership. The impact of a particular problem such as leachate may be a greater problem at one site when compared to another because of specific site conditions.

EPA does not believe that government actions have contributed to the problems at the landfill. Activities to date have been focused on identifying the problems. Actions will now begin to focus on remedies to those problems.

7. How much garbage is being dumped at the site?

Response: The city has estimated the average amount of refuse dumped per day is 500-600 tons.

8. Homes between the plume boundaries and the Spokane River are still on private wells. These homes should receive public water to reduce any risks of exposure that could occur.

Response: All of the homes that are near the plume or that may be impacted by the plume have access to alternate water. If the plume should shift additional areas may need to be supplied; however, pumping should reduce this risk. There is no reason to supply municipal water to residences that are not impacted by the site. Well monitoring will determine if any changes occur in the size or location of the plume.

COMMUNITY RELATIONS ACTIVITIES AT NORTHSIDE LANDFILL

Community relations activities conducted at the Northside Landfill to date have included:

- March 1985 -- Ecology took lead responsibility for site including community relations.
- August 1987 -- Community interviews were done by EPA and the contractor for Draft Revised Community Relations Plan.
- November 1987 -- Draft Revised Community Relations plan submitted to EPA by the contractor.
- May 12, 1988 -- Fact Sheet was distributed announcing a consent order between EPA and Spokane to complete the Remedial Investigation.
- September 1, 1988 -- An EPA Fact Sheet was distributed announcing a public meeting on RI results and to provide a written overview of results.
- September 15, 1988 -- EPA held Public Information Meeting on RI results. Three people attended.
- February 28, 1989 -- EPA distributed a Fact Sheet on proposed plan and announced public meeting on March 15, 1989.
- February 28, 2989 -- EPA put a paid advertisement in Spokesman Review on public meeting.
- March 15, 1989 -- EPA held a public meeting on the proposed plan. Approximately 45 people attended and 10 people gave oral comments. A transcript of this meeting is available at the Spokane Public Library and the Engineering Services Library in City Hall.
- March 1 - 31, 1989 -- Public comment period held on proposed plan. EPA received 23 letters during the public comment period.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

ADMINISTRATIVE RECORD INDEX

for

NORTHSIDE LANDFILL

Spokane, Washington

July 6, 1989

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3. NPL Listing and Comments

00000010.	National Priorities listing and comments	The Site Itself, physical data and maps	4/3/84	6	James Maum, Jim Oberland, both authors	

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00000011.	National Priorities listing and comments	Letter re proposed action on Northside Landfill	8/16/84	2	Kathy M. Davidson, EPA	Ken Bock, WA Planning & Community Affairs Agency
00000079.	NPL Listing and Comments	Summary of comments and response	No date	4	Terry L. Novak, City of Spokane, C. Scott Parrish, EPA	
00000080.	NPL Listing and comments	Letter re request for removal of the Northside Landfill from the proposed national priorities list	11/20/84	3	Terry L. Novak, City of Spokane	Russ Wyer, EPA
00000082.	NPL listing and comments	Federal Register, Vol. 49, No. 200, pp. 40320-40352. Proposed Rule, NPL listing	10/15/84	33	EPA	
00000083.	NPL listing and comments	Federal Register, Vo. 51, No. 111, pp. 21054-21098. NPL Listing, final rule and proposed rule	6/10/86	45	EPA	

4. State/PRP Cooperative Agreements

00000012.	State/PRP Cooperative Agreements	Agreement between WA Dept. of Ecology and City of Spokane,	2/11/86	9	Terry L. Novak, City of Spokane	John D. Littler, WA St. Dept. of Ecology
00000092.	State/PRP Cooperative Agreements	Agreement between City of Spokane and WDOE related to CH2M Hill Landfill Monitoring Study	3/14/86	10p.	Marilyn J. Montgomery City of Spokane	Frank Gardner WDOE

5. Mult-Site Cooperative Agreements

00000013.	Multi-site cooperative agreements	Letter re proposed action on Northside landfill	8/16/84	2	Kathy M. Davidson, EPA	Ken Bock, WA Planning & Community Affairs Agency
00000014.	Multi-site cooperative agreements	Federal Assistance Application Form with project narrative statements, budget breakdown, forward planning activities, letter from Attorney General Office regarding Cooperative Agreement between US EPA and State	10/22/84	11	WDOE	EPA

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00000015.	Multi-site cooperative agreements	Letter regarding cooperative agreement between US EPA and State	2/27/85	4	Charles B. Roe and Charles K. Dowthwaite, Office of the Attorney General	Andrea Beatty Riniker, DOE

00000016.	Multi-site cooperative agreements	Letter with attached amendment; Federal Assistance Application; project narrative statement	3/11/85	15	Lynda Brothers, WDOE	Ernesta Barnes, EPA
00000017.	Multi-site cooperative agreements	Letter regarding finalization of statements of work for the Northside and Greenacres landfills	4/16/85	2	Dan Swenson, WDOE	Neil Thompson, EPA
00000018.	Multi-site cooperative agreements	Memo re Superfund cooperative agreement No. V-000283-01	12/31/85	2	Kathryn M. Davidson, EPA	Oddvar K. Aurdal, EPA
00000019.	Multi-site cooperative agreements	Letter with attached amendments; Federal assistance application form; statement of work; agreement between WDOE and City of Spokane	1/16/86	16	John D. Littler, WDOE	Ernest Barnes, EPA
00000020.	Multi-site cooperative agreements	Amendment to cooperative agreement No. V-000283-01	2/21/86	2	Kathryn M. Davidson, EPA	Arv Aurdal, EPA
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00000025.	Work plans and assignments	Feasibility study work plans, drafts	No date	13	City of Spokane	EPA
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00000090	Work Plans and assignments	comments on feasibility study work plan	8/2/88	2	Dave Kargbo WDOE	Neil Thompson EPA

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00000027.	Remedial investigation report	Suggested test wells and map	10/83	2	Unknown	
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00000088.	Remedial Investigation report	Supplemental RI Addendum	7/88	95p	CH2M Hill	City of Spokane
00000089.	Work Plans and assignments	feasibility study work plan	6/30/88	12	CH2M Hill	City of Spokane
00000090.	Work Plans and assignments	comments on feasibility study work plan	8/2/88	2	Dave Kargbo WDOE	Neil Thompson EPA
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00000092.	State/PRP Cooperative Agreements	Agreement between City of Spokane and WDOE related to CH2M Hill Landfill Monitoring Study	3/14/86	10p	Marilyn J. Montgomery City of Spokane	Frank Gardner WDOE
00000093.	Remedial Investigation Report	RI Final Report	11/88	346p	CH2M Hill	City of Spokane

8. Feasibility Study

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9. Correspondence: RI/FS

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00000031.	Correspondence re remedial investigation feasibility study	Letter re remedial investigation report	6/28/85	4	Terry Novak, City of Spokane	Russ Wyer, EPA
00000032.	Correspondence re remedial investigation feasibility study	Letter re applicable or relevant and appropriate requirements	5/22/87	1	Neil Thompson, EPA	Fred Gardner, WDOE
00000096.	RI/FS correspondence	North Landfill Supplemental RI/FS Monitoring Well MW-W Relocation	4/26/88	7p	James S. Correll Ch2M Hill	Neil Thompson EPA

10. Comments - RI/FS

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00000097.	Comments - RI/FS	Review of Northside Landfill RI/FS - Risk Assessment	7/10/87	2	Dana Davoli/EPA	Neil Thompson EPA
00000098.	Comments -RI/FS	Comments on Draft FS	8/11/87	6p	Peter Kmet WDOE	Phil Williams City of Spokane
00000099.	Comments - RI/FS	Response to 8/11/87 letter	9/25/87	35p	Phil Williams	Peter Kent
00000100.	Comments - RI/FS	Preliminary comments on CH2M Hill's RI/FS proposal	11/23/87	6p	Marsha Beery EPA	Jerry Neal Lukins and Annis Washington Trust Financial Center
00000101.	Comments - RI/FS	List of Technical items to consider before completing RI/FS	11/30/87	2p	Marsha Beery WDOE	Phil Williams, City of Spokane
00000102.	Comments - RI/FS	Letter containing Northside RI comments	8/?/88	5	Neil Thompson City of Spokane	Phil Williams City of Spokane
00000103.	Comments - RI/FS	DOE comments on Northside FS	9/8/88	8p	Dave Kargbo WDOE	Neil Thompson EPA
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00000105.	Comments - RI/FS	DOE comments on Northside RI	10/17/88	3p	Dave Kargbo	Neil Thompson

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00000129	Comments - RI/FS	Comments on results of RI/FS	03/08/89	1p	Dennis K. Kroll Spokane County Health District	Neil Thompson EPA
00000130	Comments - RI/FS	Comments on results of RI/FS	03/13/89	1p	Nancy Bowen	Neil Thompson EPA
00000131	Comments - RI/FS	Comments on results of RI/FS	03/14/89	1p	Jean Silver WA State Representative	Neil Thompson EPA
00000132	Comments - RI/FS	Comments on results of RI/FS	03/15/89	1p	John G. Bjork City of Spokane	Neil Thompson EPA
00000133	Comments - RI/FS	Comments on results of RI/FS	03/17/89	1p	Shirley Rector WA State Representative	Neil Thompson EPA
00000134	Comments - RI/FS	Comments on results of RI/FS	03/20/89	1p	Eric Cutbirth	Neil Thompson EPA
00000135	Comments - RI/FS	Comments on results of RI/FS	03/21/89	1p	Allan A. Bonney Attorney at Law	Neil Thompson EPA
00000136	Comments - RI/FS	Comments on results of RI/FS	03/27/89	2p	Mr. and Mrs. James Kirk	Neil Thompson EPA
00000137	Comments - RI/FS	Comments on results of RI/FS	03/27/89	1p	John G. Bjork City of Spokane	Neil Thompson EPA
00000138	Comments - RI/FS	Comments on results of RI/FS	03/28/89	1p	Mary F. and John T. Whalen	Neil Thompson EPA
00000139	Comments - RI/FS	Comments on results of RI/FS	03/28/89	3p	Anita S. Messex	Neil Thompson EPA
00000140	Comments - RI/FS	Comments on results of RI/FS	03/29/89	2p	Janel and T.W. Dudley City of Spokane	Neil Thompson EPA
00000141	Comments - RI/FS	Comments on results of RI/FS	03/29/89	2p	Phil H. Williams Environmental Programs	Neil Thompson EPA
00000142	Comments - RI/FS	Comments on results of RI/FS	03/29/89	1p	Jerry Rounsville	Neil Thompson EPA

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00000145	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Mr. and Mrs. Paul Olson	Neil Thompson EPA
00000146	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Marilyn Rider	Neil Thompson EPA
00000147	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Bradford H. Baugh	Neil Thompson EPA
00000148	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Thomas and Nettie Pellow	Neil Thompson EPA
00000149	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Vella M. Kenny	Neil Thompson EPA
00000150	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Patrick S. Lanegan	Neil Thompson EPA
00000151	Comments - RI/FS	Comments on results of RI/FS	03/30/89	1p	Ray E. Casselman	Neil Thompson EPA
00000152	Comments - RI/FS	Comments on results of RI/FS	03/31/89	4p	Otto L. Shumacher	Neil Thompson EPA
00000153	Comments - RI/FS	Comments on results of RI/FS	04/04/89	2p	Glenn and Marilee Neher	Neil Thompson EPA

11. Sampling Plans

00000033.	Sampling plan	Groundwater sampling and analysis plan, draft	11/86	45	City of Spokane	
00000107.	Sampling plan	Field Sampling Plan North Landfill, City of Spokane, WA.	3/88	62p	CH2M Hill	
00000108.	Sampling plan	Draft Quality Assurance Project Plan - Supplemental RI North Landfill	3/88	15p	CH2M Hill	
00000109.	Sampling Plan	letter commenting on sampling plan	4/13/88	3p	Dave Kargbo WDOE	Neil Thompson EPA

12. Permit and Permit Application

00000035.	Permit and permit application	Letter regarding Northside Landfill Permit Application; copy of sanitary landfill permit application; addendum	3/29/79	15	James L. Maum, WDOE	John Anisetti, County Health District
00000110.	Permit and permit Application	Amendment of Solid Waste Disposal Site Permit	7/8/88	15p	Mary Q. Luther Spokane County Health District	Phil Williams, City of Spokane WA

13. Reference Materials/Listing of Guidances

00000036.	Reference materials; listing of guidance	Guidances for administrative record; actual guidance can be found at EPA	No date	2	Neil Thompson, EPA	

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000111	Reference materials listing of guidance	Guidance Memorandum on Use and Issuance of Administrative Orders under Section 106(a) of CERCLA	9/15/87	37p.	Lee M. Thomas EPA	Regional Administrators Regions I-X
00000112	Reference materials listing of guidance	Delegation of Remedy Selection to Regions	3/24/86	4p	J. Winston Porter	Regional Administrators

00000113	Reference materials	ROD:Des Moines TCE, 1A (used as Directive)	7/86	48p	EPA	

13. Community Relations

00000037.	Community relations	News release regarding Northside Landfill Superfund designation	10/7/85	3	Dennis Hine, City of Spokane, Refuse Division	
00000038.	Community relations	Letter with attached community relations plan--first draft	10/11/86	4	George Cole, Media West	Phil Williams, City of Spokane
00000039.	Community relations	News release re December 11 meeting	12/4/86	1	City of Spokane	
00000040.	Community relations	Public meeting notice	12/11/86	1	Phil Williams, Spokane Office of Environmental Programs	
00000041.	Community relations	Statement of work re community relations plan and implementation for the Northside Superfund site	4/10/87	2	J. Schwarz	
00000042.	Community relations	Procurement request order form re community relations plan and implementation support for Northside Landfill; work assignment form; statement of work	6/19/87	6	Francis Chapman, EPA	
00000068.	Community relations data	Memo re representative Stratton request for information on the Spokane aquifer/ letter re test results from Community against pollution (2/6/84)/attached general information	2/6/84	4	Glenn Grace, WDOE	Don Dubois, Joan Thomas

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000114.	Community relations	Fact sheet - Environmental investigations at the Northside Landfill	5/12/88	2p	EPA	
00000115.	Community relations	Revised Community Relations Plan, Northside Landfill	9/88	19p	EPA	
00000116.	Community relations	Northside Landfill Fact Sheet	9/1/88	2p	EPA	
00000125.	Community relations	Fact Sheet - Northside Landfill Proposed Plan	02/28/89	6p	EPA	

00000126.	Community relations	Fact Sheet - Synopsis of Northside Landfill Responsiveness Summary	05/02/89	3p	EPA
00000127.	Community relations	Northside Landfill Responsiveness Summary	05/89	12p	EPA

. Newspaper Clippings

00000044.	Newspaper clippings	Landfill lawsuit initiated	8/18/78	1	Unknown
00000045.	Newspaper clippings	Toxic waste cleanup moving ahead; But county, city balking on two sites	11/18/84	1	Jeff Sher, Spokesman-Review
00000046.	Newspaper clippings	Garbage a nationwide problem	3/17/85	1	Ken Sands, Spokesman-Review
00000047.	Newspaper clippings	Finding a home for garbage	3/17/85	2	Ken Sands, Spokesman-Review
00000048.	Newspaper clippings	County, city officials lean toward 'mass burn' system	3/18/85	1	Ken Sands, Spokesman-Review
00000049.	Newspaper clippings	Plant expensive, but so is alternative	3/18/85	2	Ken Sands, Spokesman-Review
00000050.	Newspaper clippings	Where will your garbage go?	3/18/85	1	The Spokesman-Review
00000051.	Newspaper clippings	City says plant won't burn dollars	3/19/85	2	Rick Bonino, Spokesman-Review
00000052.	Newspaper clippings	Cities, firms plant's partners	3/19/85	1	Ken Sands, Spokesman-Review
00000053.	Newspaper clippings	State gets cash to probe 3 landfills	4/17/85	1	The Post-Intelligencer
00000054.	Newspaper clippings	Northside pollution felt stabilized	12/11/85	1	Jeff Sher, The Spokesman-Review

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000055.	Newspaper clippings	Underground pollution from fill not spreading	12/12/86	1	Rick Bonino, Spokesman-	
00000056.	Newspaper clippings	Municipalities sing requiem for	12/15/85	1	The Spokesman-Review	

landfills

16. Lab Reports & Data

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000057.	Lab reports and data	WSU tests	5/25/77-6/12/78	2	Unknown	
00000058.	Lab reports and data	208 lab tests; Spokane Aquifer Water Quality Study Chronological Display	8/21/78	3	Idaho Health and Welfare Lab	
00000059.	Lab reports and data	Extended monitoring data	2/4/79	3	EPA Lab	
00000060.	Lab reports and data	Water sample reports	11/16/83	1	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000061.	Lab reports and data	Water sample reports	11/16/83	1	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000062.	Lab reports and data	Water sample reports, Lab No. 1645-83	11/17/83	2	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000063.	Lab reports and data	Water sample report. Lab No. 1655-83.	11/21/83	1	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000064.	Lab reports and data	Water sample reports, chain of custody records, field reports. Lab No. 1704-83	12/16/83	15	W. E. Burkhardt, ABC Laboratories, Inc., George Maddox & Assocs.	Dept. of Public Utilities, Refuse Div., Dennis Hine
00000065.	Lab reports and data	Water sample reports. Lab No. 1704-83.	12/16/83	3	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000066.	Lab reports and data	Water sample reports. Lab No. 1744-84, 1748-84	1/9/84 1/16/84	3	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refuse Div.
00000067.	Lab reports and data	Water sample reports. Lab No. 1781-84	1/20/84	2	W. E. Burkhardt, ABC Laboratories, Inc.	Dept. of Public Utilities, Refus Div.
00000069.	Lab reports and data	Memorandum regarding North and South Landfill water samples; attachments of	3/8/84	20	Dale Arnold, Lab Supervisor	John Swanson, Director of Public Utilities

		water samples analysis and results				
00000070.	Lab reports and data	Results of laboratory analyses of South Landfill water samples	6/20/84	2	Unknown	
00000071.	Lab reports and data	Northside Landfill residential well sampling	8/84	1	Unknown	
00000072.	Lab reports and data	Field report on residential well sampling, chain of custody record, conductivity graphs	8/15/84	38	Joanne Ellison	City of Spokane, Refuse Division
00000073.	Lab reports and data	Water sample report. Lab No. 2376-84.	8/20/84	1	W. E. Burkhardt, ABC Laboratories	Dept. of Public Utilities
00000074.	Lab reports and data	Results of gas well monitoring Southside Landfill, Northside Landfill chain of records, residential well sampling, water testing	6/21/84	20	Joanne Ellison, Richard Schram, City of Spokane, Refuse Div.	
00000075.	Lab reports and data	Memorandum re QA of organic samples Case 3184 for Spokane Steel, Northside Landfill, Southside Landfill and Mica Landfill. Attached organics analysis data sheets.	12/18/84	10	Andrew Hafferty, Jim Farr, Ecology & Environment	John Osborn, EPA
00000117.	Lab Reports & Data	Northside Landfill Methane Gas Data	5/17/88	3p	Rhys. Al Sterling Spokane County Health District	Phil Williams City of Spokane

17. Miscellaneous Correspondence

00000076.	Correspondence -Misc.	Letter regarding hazardous waste waiver request, Northside Landfill	6/8/79	2	Edward M. Pickett, Spokane County Health District	Roger James, City Utilities Director
00000118.	Correspondence -Misc.	Notification to prioritize Northside site	12/7/87	1p	Carol Rushin EPA	Peter Kmet WDOE

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000119	Correspondence -Misc.	Request for information on 106 order	12/30/87	1p	Marsha A. Beery WDOE	Neil Thompson EPA

18. Miscellaneous Memoranda

00000077.	Memoranda	Memoranda regarding phone conversation with Lynn Guy about groundwater contamination from Northside.	11/15/83	1	Rene Fuentes	
00000078.	Memoranda	Memorandum regarding status report - Pine Meadows/Lowell Avenue water service	2/16/84	2	C. D. Robinson, Jr., City of Spokane	

19. Enforcement - Administrative Orders

00000120.	Enforcement - Admin Orders	letter regarding calculation of costs in Order on Consent	3/11/88	1p	Neil E. Thompson EPA	Phil Williams City of Spokane
00000121.	Enforcement - Admin Orders	Order on Consent	3/15/88	33p	EPA	City of Spokane

Doc#	File	Type/Description	Date	# Pages	Author/Organization	Addressee/Organization
00000122.	Enforcement - Admin Orders	Change of information on Consent Order	3/16/88	1	Irving B. Reed City of Spokane	Neil Thompson EPA
00000123.	Enforcement - Admin	Comments on EPA's Consent Order	4/12/88	2p	Dave Kargbo WDOE	Neil Thompson EPA

20. Notice Letters and Responses

00000084.	Notice Letters & Responses	Notice letter to state re proposed Superfund projects	8/16/84	2	Kathryn M. Davidson, EPA	Ken Bock, WA Planning & Community Affairs Agency
00000085.	Notice Letters & Responses	Letter of notification re potential liability for federal actions at Northside Landfill	9/30/85	1	Charles E. Findley, EPA	Terry Novak, City of Spokane
00000086.	Notice Letters & Responses	Letter of notification re potential liability on behalf of the State of WA	1/10/86	2	Fred Gardner, WDOE	Terry Novak, City of Spokane
00000087.	Notice Letters & Responses	Letter of notification re potential liability on behalf of the State of WA	1/10/86	2	Fred Gardner, WDOE	Dennis Hein, City of Spokane

21. Health Assessment

00000124. Health Assessment Health Assessment for North Landfill 5/25/88 15p ATSDR

sampling

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2/22/89